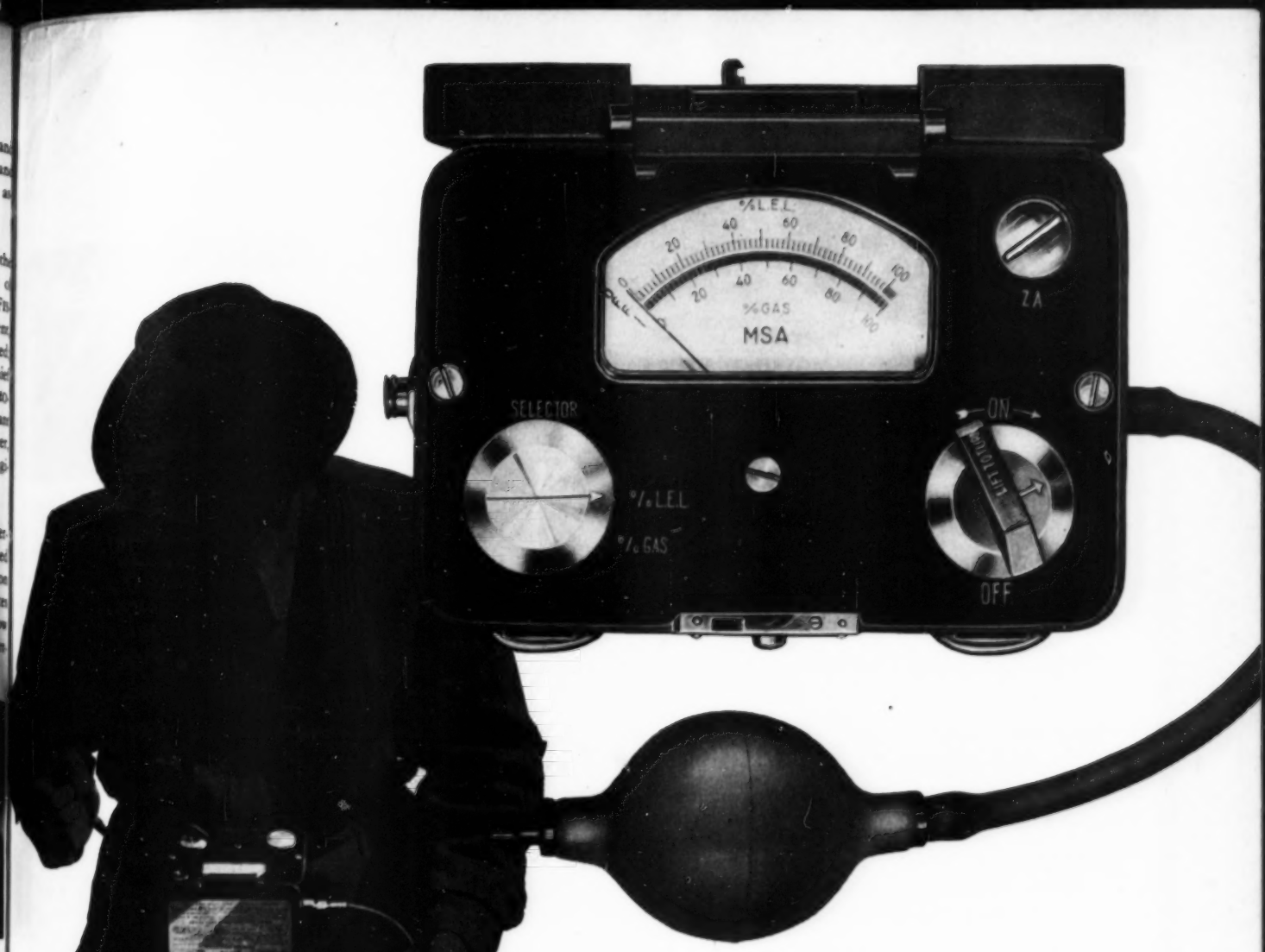

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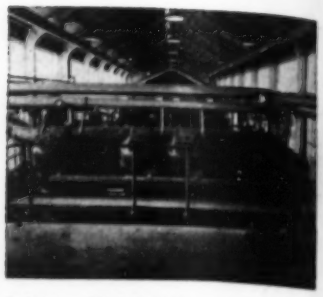

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This interior view of United's Agua Dulce engine room shows some of the vapor-phase cooling equipment used. For more details, see story beginning on page 91.

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Thermally Thinking

SPOT NEWS AND COMMENT ON GAS INDUSTRY AFFAIRS

Highlighting the News

Texas Illinois builds largest bridge span

Across tthe Mississippi, 80 miles north of Cairo, Ill., Texas Illinois Natural Gas Co. is beginning construction of the world's longest main suspension bridge span at a cost of $3.8 million. The 3600-ft bridge will have a main span of 2150 ft. Two 30-in. lines will traverse the bridge, supplementing present underwater lines.

Toronto gets ready for natural gas

Expecting natural gas by Nov. 1, Consumers Gas Co. of Toronto, Can. has begun work on a 21-mile line to bring the gas into the city, and has launched a $3.5 million conversion program. The company also has a new manager—Oakah Jones from Oklahoma City, an experienced hand in natural gas affairs. The company expects to boost first-year sales (estimated) from 8 billion annually to 22.6 billion by the end of the fifth year.

AGA distributes PEP folders

The 1954 PEP (Performance, Economy, Profit) campaign is set to go, and AGA has been distributing huge portfolios stuffed with money-making ideas for a renewal of the commercial gas cooking sales effort. Testimonials on 1953 successes show that those utilities that participated to the hilt were enthusiastic.

Supreme Court may debate new twist on well price fix

Natural Gas Pipeline Co. of America has sought high court review of an Oklahoma supreme court decision upholding the right of Panoma Corp. to charge Natural the state-fixed 7-cent minimum for its gas regardless of profit made by Panoma from ingredients extracted during processing before the gas is sold. The state corporation commission held Panoma entitled to the minimum price protection, and the state high court affirmed.

FPC pulls surprise in "enforcing" Phillips decision

The commission moved faster than anticipated when, in a sweeping order issued July 16, it laid down rules governing the estimated 4100 independent producers and gatherers now assumed to be under its jurisdiction as the result of the Supreme Court's ruling in the Phillips Petroleum case. The order was retroactive to June 7, the date of the court's decision. "Any action requiring commission approval is not effective without it," ruled the commission. The rules prevent producers from engaging in new service *and from abandoning present service* without first obtaining FPC approval.

Commission may concentrate efforts on largest hundred

Chairman Kuykendall, in asking the Senate for $300,000 additional appropriation to handle the increased work load, revealed he is planning to classify producers by size in order to concentrate on the largest. Small producers would not be exempted, but would receive scant attention from the commission. FPC intends to reopen the Phillips case and "make determinations with respect to the appropriate level of rates for natural gas sold to pipeline companies," he said.

Five companies file for Pacific Northwest rehearing

In a desperate move to persuade FPC to reverse itself on the Pacific Northwest decision, Westcoast (the unsuccessful bidder), Trans-Northwest (which would have transmitted Canadian gas to several U. S. localities), Southern California Gas Co., and Southern Counties Gas (who would like to reserve San Juan gas for California and Southwest consumption) got in under the wire with a request for rehearing. By mid-month, FPC must either accept or deny. Thence the case will likely go to the courts. The National Coal Association also joined in the clamor for a rehearing.

Water heater shipments top three-year record

The magnificent recovery in gas water heater sales in recent months was topped off by June's shipment totals, GAMA reports. That month was the best in the last 38, exceeding every month's total since March 1951. The 208,400 units delivered surpassed June 1953, by 18.5% when the aggregate reached only 175,800. The new high mark enabled the year-to-date aggregate for the first six months to climb within 2700 units (a slim .2%) of the record for the first six months of 1953.

An Eye on the Capital

The balance sheet is favorable

Congress has departed these parts, without having disturbed the 27½% natural gas and oil depletion allowance provisions and having passed numerous pieces of legislation favorable to the natural gas industry, and, in fact, to all private industries.

If anything, however, the Federal Power Commission has moved faster than Congress in favor of the natural gas industry, although the Eisenhower Republicans who now dominate the FPC scenery would be the first to say that they have had no thought of helping the industry, that their first consideration has been to the benefit of the public through making the industry stronger and better able to give good service.

Thermally Thinking

At any rate, labor magazines and segments of the public press seem to follow the labor line, have been getting more and more critical of the FPC as 1954 has worn on. The use of the "fair field price" formula, in the case involving the Panhandle Eastern Pipe Line Co., continues to receive a pummelling in the labor press and from many different influential newspapers, editorially.

The opposition has been more vehement against the Eisenhower administration for its FPC appointments than even for the actions of those appointees. Every time someone like former chairman Thomas Buchanan, or Dale Doty, or other New Deal hangovers, has been eliminated, the labor press has bayed at the administration's heels.

The latest yelp came when the President refused to re-appoint Mr. Doty, a former New Deal official of the Department of the Interior, and, instead, named Frederick Stueck, former chairman of the Missouri Public Service Commission, to the FPC. He was confirmed in early July for the five-year term. This means that the FPC now has three Republicans, one Democrat and one Independent.

Mr. Stueck was a practicing attorney in St. Louis from 1929 to 1941. He was vice president of the Transit Casualty Co. in St. Louis, and served as administrative assistant here to former Sen. Forrest Donnell (R.-Mo.). The labor press labeled him as "just another Donnell," for Donnell is known among laboring men generally as a "reactionary," although he made a fair record while serving as senator from Missouri.

The price freeze is on

Actually, the Supreme Court seems to been the only branch of the government to have won the approval of the labor press this year, in regard to natural gas matters. The Supreme Court's decision in the now-famous Phillips case won loud huzzahs from all segments of the labor press and from the dailies that follow the line laid down by labor leaders.

This decision is giving the Federal Power Commission more headaches than anything that Congress has done, or that any other court has done, during 1954.

The FPC moved in early July to freeze all natural gas prices at the June 7, 1954, level as a start toward its regulation of 4100 independent producers brought under its jurisdiction by the Supreme Court decision. At the same time, the FPC issued other regulations applying to industry activities on and after June 7, the date of the Phillips case decision by the Supreme Court.

Meantime, Phillips has asked the high court to reconsider its ruling, but chances that this will be done are remote. Whether successful or not, it will be fall before a decision can be made, and, meantime, FPC had to act. Several states also are joining in asking for the rehearing.

The commission's vote on the freeze order was three to one, with Seaborn Digby dissenting. He said that the June 7 effective date violates the Natural Gas Act, which prohibits fixing rates retroactively.

Congressional sentiment on the freeze order generally was restrained, although most Republicans from the middle west were favorable to it. Sen. Homer Ferguson (R.-Mich.), fighting hard for reelection and trying to make it seem that he has not been overly partial to utilities, as his opponent has charged, hailed the FPC freeze action. He said it will "have real meaning to Michigan consumers of natural gas in preventing rate increases."

Under the new FPC regulations, sales contracts that were in effect as of June 7 must be filed with the commission by Oct. 1. No rate increase can go through unless it is first filed, and approved.

Incidentally, because of the Phillips decision, the administration officially asked Congress to appropriate an extra $300,000 for the FPC to meet the expense of the FPC's expanded duties.

Storage bill is compromised

There was a flurry of activity in Congress in the closing days of the second session, as there always is in the final wind-up, and several bills were passed of interest to the natural gas industry.

Greatest interest, of course, was in the tax revision legislation, which overhauls the internal revenue structure more comprehensively than any measure passed in perhaps 20 years.

The Congress also passed three bills to aid natural gas exploration and development on public lands under lease arrangements. One (S. 3344) allows gas and oil developments on lands leased for mining. The others (S. 2380 and S. 2381) amend the Mineral Leasing Act of 1920, changing the amounts of acreage that may be held and the time and payments of the leases, in an effort to stimulate gas or oil development.

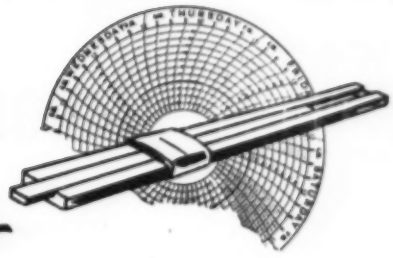
Differing views of coal and gas industries were reconciled in a compromise bill offered as an amendment to the Douglas-Dirksen bill (S. 525), dealing with underground storage, which could have slipped through both houses of Congress in the final days, but actually died in the Senate Committee on Interstate and Foreign Commerce. The new measure was reported by the Senate Interstate Commerce subcommittee on business and consumer interests, and covers the condemnation of underground storage areas via a proposed amendment of Section 7 (h) of the Natural Gas Act. The coal mining industry urged the consideration of stricter safety standards, and a compromise substitute, which was adopted, provides for an 11-man commission that would study the problem and make recommendations for its permanent solution within one year.

Other provisions of the original Douglas-Dirksen bill would be put into operation, with approval of the FPC and subject to certain limitations, under the compromise. Applicants would file with FPC for certificates of convenience for each proposed reservoir, stating whether or not it underlies commercially recoverable coal or other mineral deposits, except petroleum or natural gas. Public notice would be given to the applicant of its intention to seek condemnation. The U. S. Bureau of Mines, Department of Interior, would conduct an investigation if the proposed underground storage reservoir were to underlie a mine. An adverse report from the Department of Interior would bar the FPC from granting the certificate. The bill, while not adopted this year, likely will be used as a model next year for legislation in this vital field.

Senate hearings on the Ferguson bill

Continued on page 60

Technical Trends



• By GUY CORFIELD

Soil conditioning

Improving the properties of soils, by mechanical, physical, electrical, thermal, or chemical means, is a subject on which a great amount of work is currently being done because of its obvious potential usefulness; so far, however, soil conditioning is a new science that is in a relatively undeveloped state, particularly as regards the use of chemicals (some chemicals, even in trace amounts, have surprising effects that are not understood and may be complex chemical reactions or may involve surface electrical changes in the individual soil particles). Basically there would seem to be two purposes in soil conditioning, one related to improvement for agricultural purposes, and the other concerned with altering physical, chemical or electrical properties as such. This discussion is on the latter, and there are a variety of approaches and also a variety of objectives, some of which are of interest to the gas industry.

Typical of these objectives are soil treatments for increasing the load bearing strength or stability, decreasing or increasing water permeability, changing electrical resistance, and altering corrosion environments. Bearing strength, for foundations, etc., can be improved by mechanical densification. Stability can be augmented by addition of cement, bituminous materials, silicates, etc., and by rendering the soil water-repellant by chemical additives; this would be of help to prevent washouts along pipeline rights-of-way. Increasing water permeability might assist backfill and compacting operations by making it easier to dampen or wet soils that have been excavated and have become very dry. If the soil in the immediate vicinity of a cathodic protection anode could be permanently made more electrically conductive, or if a body of soil in place could be made sufficiently conductive to act itself as an anode, one of the major factors in cathodic protection station design would be materially assisted. Reducing the general corrosivity of the soil in which a pipe is installed may be more than can be hoped for, but the treatment of soil or backfill so that it will discourage the activity of anerobic bacteria, either by a "poisonous" effect or by elevation of pH, has been considered and tried to a limited extent. There are, of course, practical considerations such as cost of additives, means of incorporating them in the soil, effective life of the application, avoidance of secondary effects that might be objectionable (i.e., treatment of backfill that might give stability but would also cause corrosion) that must be evaluated. Soil conditioning has been described by one authority as one of the most promising fields for major research, and the gas industry will be well repaid for close attention to developments.

Water treatment gadgets

Water being one of the principal and most essential commodities of human existence and modern living, used in every sphere of private life and industrial activity, it is not surprising that processes and devices for its purification and improvement have developed a wide field of ingenuity, sales effort and purchaser reception. Furthermore, the technology of water treatment is as varied and complex as the multitude of uses to which water is put, and experts disagree with resulting frustration to maintenance engineers and bafflement or blind acceptance to the non-technical public. This creates a fertile environment for a variety of recommended treatments ranging from legitimate technical processes to out-and-out gadgets. It is the latter with which we are concerned at the moment.

These gadgets are often presented and described very cleverly in scientific or semi-technical double talk that is unintelligent to an engineer but impressive to non-technically educated people who are constantly hearing of the wonders of modern science and are inclined to believe that, because of the revelations and advances of nuclear fission, etc., normal concepts of chemistry and physics are old fashioned and anything is possible, the more revolutionary and fantastic the better. The presentations are so convincing that reputable technical and trade journals, and household magazines, have in some instances provided advertising space. Testimonials can readily be obtained from people who genuinely believe a device has been effective, perhaps by accidental circumstances that actually made it appear so, but primarily by the basic subconscious desire to justify their judgment and expenditure.

Some of the claims made for these gadgets are that they inhibit scale formation, remove scale already formed, prevent corrosion, improve or remove odor, make water taste or "feel" better, require less soap for laundering, and improve vegetation growth. They frequently involve some application of electric current flow through the water, either alternating, direct, or interrupted from an external source, or direct from internal galvanic source; their action may be attributed to magnetic, supersonic or ionic effects; or the effectiveness may be ascribed merely to some amazing new discovery.

Beyond a technical appraisal of the device, some information may be derived by insistence on obtaining names of endorsers and verifying the statements attributed to them. If tests have to be made to prove or disprove the claims, care should be taken to select methods that will reproduce specific recommended applications so that the results cannot be protested as unfair or non-representative of the intended use.

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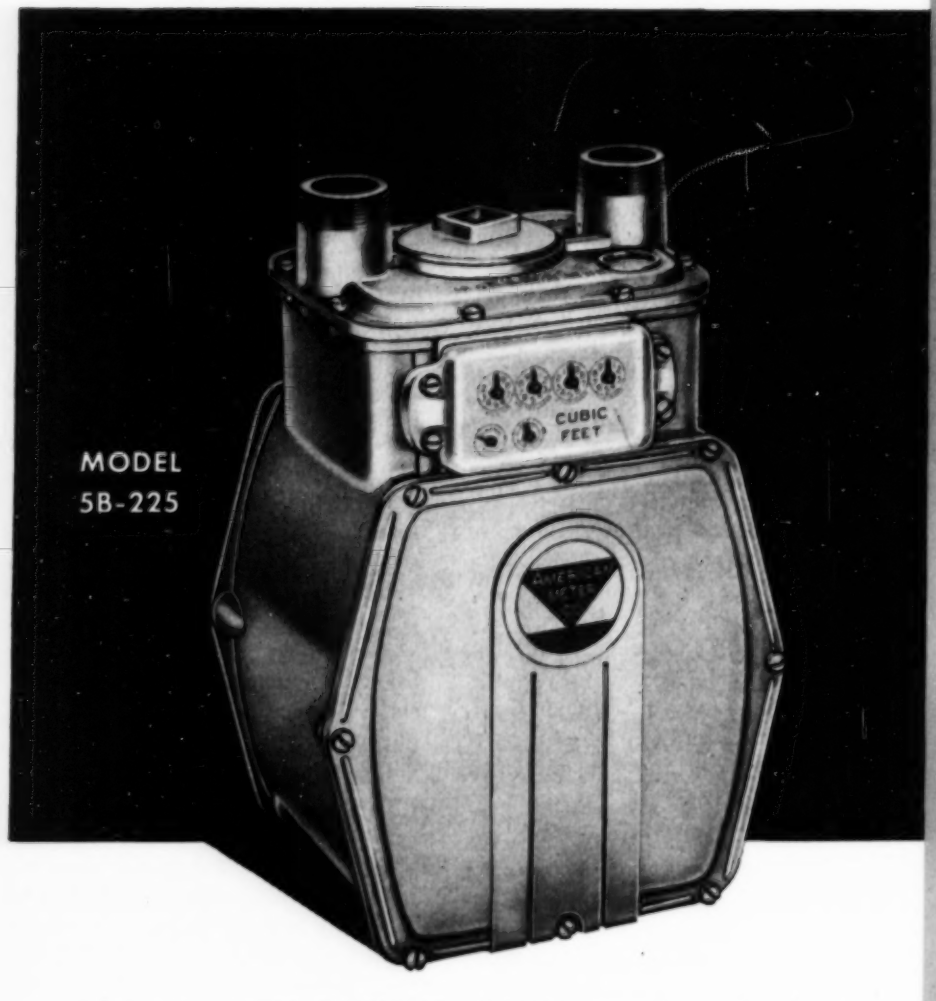

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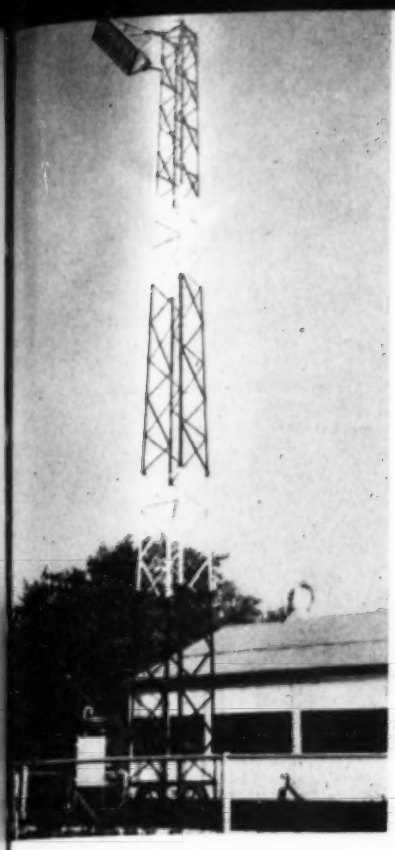


$35 million invested in equipment today, with an additional $10 million planned

Gas companies flock to radio to improve service, cut costs

By FRANK CHAPMAN · Editor

NOTHING speaks more for the gas industry's effort to better serve its customers than the estimated $35 million that it presently has invested in radio communication facilities. Built up almost entirely over the past 10 years, this industry-wide stake in a policy of good customer service has been accumulated from an annual expenditure that has increased steadily from over $2 million in the early 1940s to as much as $6.5 million in the 50s. What's more, the widespread expansion of existing radio facilities plus the installation of new systems call for an estimated annual expenditure of $10 million or more in the foreseeable future.

Returns in the form of better customer relations and overall good will for the industry, although impossible to measure in dollars and cents like an expenditure, have by all indications accrued at an even faster rate than the investment. Examples of good will created by the efficient handling of gas distribution made possible through the use of radio communication are evident all the way from the wellhead to the consumer.

One cold, rainy morning last winter a Texas housewife called her local gas company office to report that her gas range and her water heater were not working; that her husband was in the middle of getting ready for work and that she was in the midst of getting the youngsters off to school. Within 15 minutes a gas company service truck arrived at her house and in another 10 minutes the servicemen had both appliances repaired and in working order.

The same winter an unexpected cold snap in the north central states created an unusually heavy demand on all natural gas pipelines servicing the area. Dispatchers quickly went into action up and down the line; loads were shifted, extra supplies of gas were taken from pipelines not affected by the cold weather, storage fields were called upon for gas and some interruptible loads were temporarily curtailed. Because dispatchers had radio communication and control facilities at their disposal for the quick and efficient manipulation of the gas supply, not a single customer in the entire area was without sufficient gas.

Ten years ago the Texas housewife would likely have sent her children off to school without a hot bath and her husband off to work without hot coffee and a good disposition. Although the quick dispatch of customer service vehicles by mobile radio is a commonplace practice at the present time for distribution companies covering large service areas, only an estimated 5% of all the nation's gas companies had such facilities during the early 1940s. Before the advent of mobile radio, the housewife's report of trouble would have been placed "on call" to be picked up and handled by the next customer serviceman to report to his base. There was no means of dispatching servicemen in the field.

Even as recently as four years ago the unexpected arrival of cold weather would have worked extreme hardships on the long natural gas pipelines serving the area, and would probably have resulted in some customers being without gas. Microwave radio has been used only since 1950 for the extensive communication, telemetering and remote control required to handle an unusually large demand on gas pipeline transmission facilities.

Prior to 1950 pipeline dispatching

GAS survey

The interest that the industry has in radio communication facilities, the investment that it presently has in radio equipment, and the expenditure that it is planning to make in both new facilities and the expansion of existing system, as evidenced by the results of this survey, have prompted GAS to schedule a series of articles on the use of radio in the industry. The subjects will be taken from specific points brought out in the survey and will deal with them in a practical manner. They will follow as they become available during the next six months.

and control was done by whatever wire line and radio facilities available; quite often even by automobile and on foot. If the cold weather that created the increased demand for gas was also accompanied by sleet and snow, as is often the case, the occasional loss of wire line communication facilities only served to heighten the emergency.

In an effort to get some rather definite picture of the growth of radio communication facilities within the industry, its present-day size and the use to which it is being put, *GAS* Magazine recently undertook a comprehensive canvass of the country's gas companies. Questionnaires were mailed to all of the largest gas distribution and transmission companies—a list that included about one-third of the nation's nearly 1100 gas companies.

Answers were received from 157 or about 45% of all those queried. Of this number, 125 companies, or more than 80% of the total answering, said they used some form of radio communication facilities in their operations.

The questionnaire was divided into three parts to provide for thorough coverage of the industry's use of radio. One section of the questionnaire referred to the industry's use of company-owned mobile radio equipment. Another section referred to the same type of service operated by the company but on a lease agreement, and a third section of the questionnaire referred to the use of microwave radio communication.

Mobile radio service, either company owned or leased, is used for communication between a fixed station and any number of mobile units. Functionally, it is used for the dispatching of customer service trucks, distribution system maintenance vehicles and any type of moving equipment used in gas company operations. The transmission company uses mobile radio for communication between a compressor station or pipeline division office and the pipeline maintenance vehicles that operate in the area. The gas industry as a whole finds new and valuable applications for mobile radio service almost daily.

Of the 80% reporting on the use of some form of radio, nearly all make use of mobile radio facilities. Of these, 67% use company-owned equipment, while 17% use leased facilities. This adds up to more than 80% because about 5% of those included in the 67% make use of both company-owned and leased mobile radio facilities. Although the majority lease from one of the common carrier services, some companies lease mobile service from the equipment manufacturer.

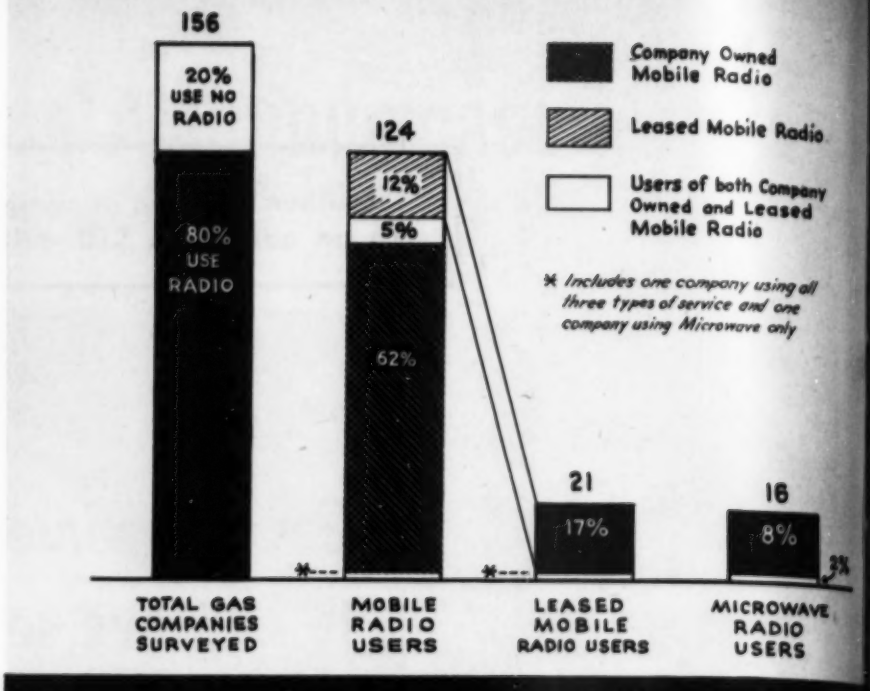


FIG. 1 · Proportion of Gas Companies using Mobile & Microwave Rad

Microwave radio, in comparison to mobile service, is used for point-to-point communication between fixed stations. A typical example of this kind of service is the microwave system that parallels the length of a long gas transmission line. Microwave servise is also used for communication between a central office and a district or division office, or between any two or more fixed locations. Functionally, microwave radio is like wire line communication and may be used in any service for which wire line is suited.

A microwave circuit has the additional characteristics of being able to handle any number of communication channels simultaneously. A single microwave circuit, for example, might carry several talking channels, telemetering and teletype channels plus supervisory control channels all at the same time.

Technically, the difference between mobile radio and microwave is equally distinct. Mobile radio operates in the frequency range from about 25 megacycles to as high as a few hundred megacycles, in what is known as the VHF (very high frequency) band. For practical purposes the mobile service band is located in that portion of the radio spectrum between the lower frequency bands adaptable to long distance communication and the higher frequency bands where only line-of-sight transmission is possible. Microwave frequencies, on the other hand, go up from 1000 megacycles where radiation takes on the characteristics of light, and transmission is by line of sight. Each is adaptable to its own particular type of service because of the transmission characteristics of the frequency band in which it operates.

The use of microwave is almost universal with the long gas transmission pipelines* Of 10 large gas transmission companies, all with more than 50 miles of line and operating revenue in excess of $5 million, replying to the questionnaire, all but one makes use of microwave radio.

A summary report on the use of radio communication facilities by reporting companies is shown graphically in *Fig. 1.*

Sixty-seven percent of those reporting, a total of 105 companies, use company-owned mobile radio facilities. Of this 105, 16 companies, representing over 10% of the total reporting, also use microwave; and eight of the companies, representing slightly under 10%, report they also use leased mobile equipment. One company reported on the use of all three types of radio service—microwave, company-owned mobile, and leased mobile radio.

*For additional comments on microwave radio as transmission companies, see Frank Chapman's Communications and Electronics column in the Pipeline section of this issue.

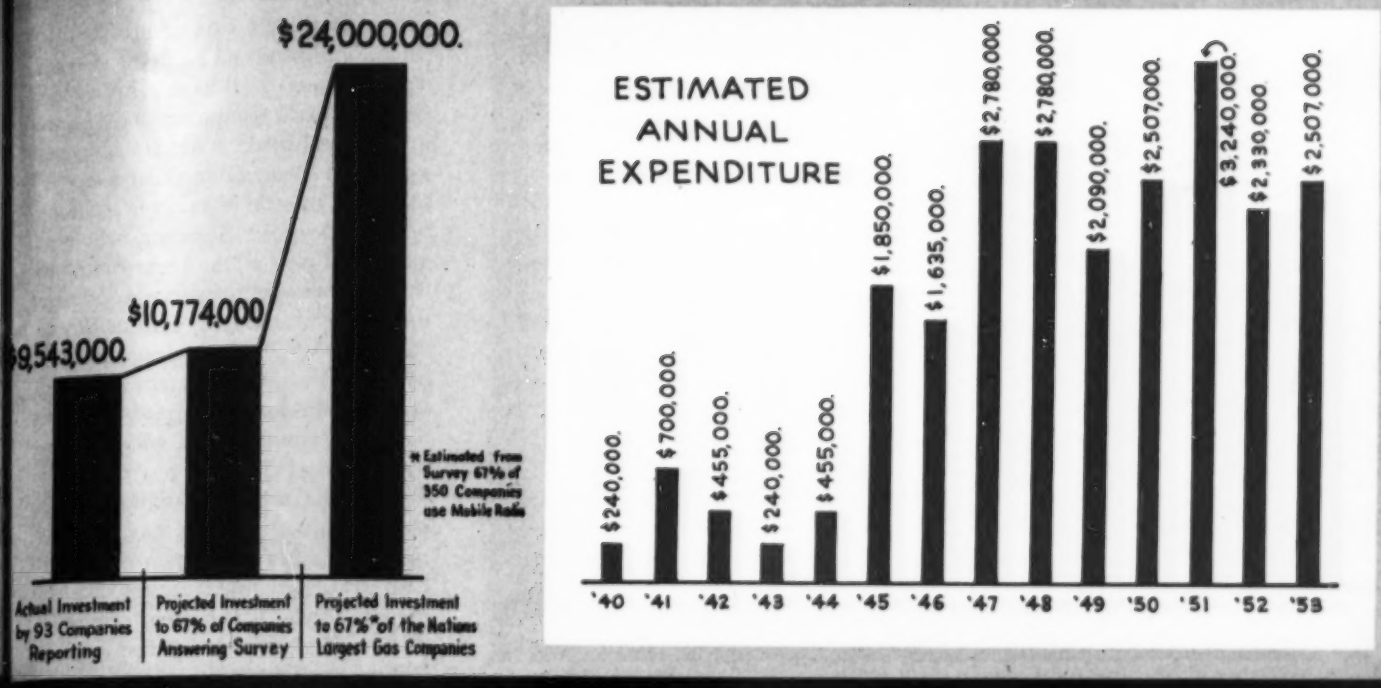


FIG. 2 · Estimated Investment in Mobile Radio by 350 Leading Gas Companies

Of the 16 microwave users reporting, all but one of them also used company-owned mobile radio service. Of the 27 companies reporting on the use of leased mobile equipment, about 15% of them lease from equipment manufacturers while the remainder lease from common carrier companies.

In general, it would seem that the returns from this canvass provide a reasonably good cross section of the country's major gas companies. Included among those answering were some of the largest distribution and transmission companies as well as some companies with as few as several hundred customers. Returns are compiled from combination gas and electric companies, companies involved in both the transmission and distribution of gas, and companies selling only manufactured gas. No effort was made to canvass any specific segment of the industry, except as brought out earlier, to include the top one-third of the industry's companies. While many companies included in the remaining two-thirds of the list make wide use of radio communication, the smaller companies have less application for this service in carrying on their operations.

The actual investment in equipment and money as reported by the companies responding might be projected to include any part of the entire industry. For the purpose of this article the actual figures have been projected to portray the total estimated investment by those companies making up about one-third of the industry, or about 350 of the country's largest gas distribution and transmission companies. (The use of microwave by transmission companies is applied in a slightly different manner and will be treated separately later.)

Ninety-three of the 105 companies reporting on the use of company-owned mobile radio had an investment that totalled $9,543,000. This figure included $5,243,000 in 7687 mobile units, $3,224,000 in 908 fixed stations and $1,076,000 in towers, auxiliary power equipment, a total of 363 "walkie talkie" sets, and other miscellaneous equipment.

Table 1 · Total investment in mobile radio by 350 leading companies

Type of Mobile Equipment	Actual Investment by 93 Companies		Estimated Investment by 105 Companies (67% Reporting Use of Radio)		Estimated Investment by 234 Companies (67% of Top 350 Companies)	
	No. of Units	Investment	No. of Units	Investment	No. of Units	Investment
Mobile Units	7687	$5,243,000	8700	$5,920,000	20,000	$13,620,000
Fixed Stations	908	3,224,000	1026	3,640,000	2280	8,100,000
Miscellaneous	—	1,076,000	—	1,214,000	—	2,700,000

These actual figures indicate a total investment in company-owned mobile equipment of some $24 million by 350 of the country's largest gas companies. This projection is tabulated in *Table 1* and shown graphically in *Fig. 2*. The estimated investment is broken down into 20,000 mobile units at a total investment of $13,620,000; 2280 fixed stations at a total investment of $8.1 million and miscellaneous equipment totalling $2.5 million.

The growth of the use of mobile radio in the industry is indicated by the years in which individual installations were first made. Of the 105 companies reporting on the use of mobile radio, only eight companies made installations prior to 1945. Since then the industry has averaged around 20 complete installations per year. The annual estimated expenditure for mobile equipment, based on the reported number of new installations each year and the estimated total investment, has varied from around $500,000 in the early 1940s to a high of $3,240,000 in 1951. Since 1947 the annual figure has varied between $2 million and slightly over $3 million. *Fig. 2* also includes a graphical representation of this estimated annual expenditure.

In reporting on their plans for the future, 72 out of the 105 companies, or about 69%, said they had plans for the expansion of existing company-owned mobile radio facilities. Forty-eight of these, or about 45%, reported

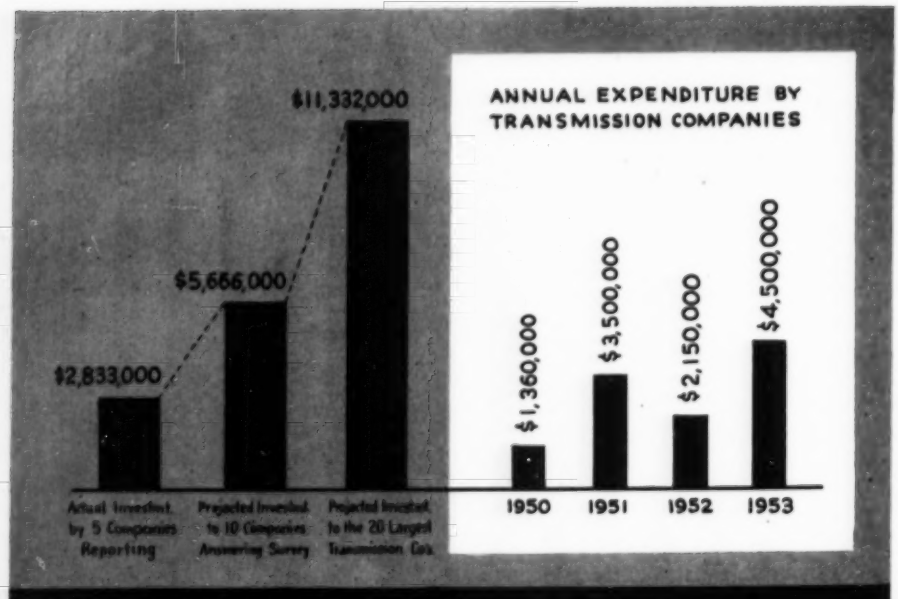


FIG. 3 · Estimated Investment in Microwave Radio by 20 Companies

Table 2 · Projected investment in microwave by transmission companies

Type of Microwave Equipment	Actual Investment by 5 Companies		Estimated Investment by 10 Companies		Estimated Investment by 20 Companies	
	No. of Miles	Investment	No. of Miles	Investment	No. of Miles	Investment
Circuit Miles	3645		7291		14,500	
Channel Miles	29,449	$2,833,000	58,898	$5,666,000	118,000	$11,332,000
Stations	135		271		542	

on specific plans they had for system expansion. A summary of these specific plans calls for the addition of 68 fixed stations at an estimated expenditure of $240,000 and the addition of 1781 mobile units at an estimated $1.2 million. In addition, two mobile radio users said they proposed to install new microwave systems.

This estimated future expansion may be projected to indicate an expenditure of nearly $5 million on mobile radio equipment by the companies making up the top one-third of the industry in the foreseeable future. Since this figure is not confined to expenditure during any specific future period, it may be taken to express expenditures over a period somewhat longer than a year. However, because it does represent a "foreseeable" expenditure it will serve to confirm an annual estimated expenditure of between $2 and $3 million, if not more.

Plans reported for the expansion of company-owned mobile radio facilities indicate the extent to which these facilities have proven worth while. The overall picture is one of system expansion to take care of the normal growth of the company's service area or gas sales as a minimum, plus the extension of existing facilities to embrace a greater portion of company operations. In some instances the company has specific plans for system expansion that are tied in with a general company expansion program. In no instance was there any suggestion of a cut in facilities.

The estimated $24 million investment in mobile radio equipment and the expected annual expenditure for the future of around $3 million provide concrete evidence of the industry's desire to better serve its customers. A major portion of this investment has been made by distribution companies for the purpose of giving housewife customers the kind of service that will cause them to buy gas appliances and to sell the merits of gas and gas service to their neighbors and friends. The housewife who does not have sufficient hot water from her gas water heater for the Monday morning washing, or the husband who goes off to work with a bad disposition because of no hot coffee or the bad humor of his wife are neither one boosters for gas service.

Good service inevitably leads to a more efficient and more economical operation. The use of mobile radio as a service arm is no exception. The dispatching of men and equipment in the field by radio will result in a more effective use of manpower and a saving in miles traveled. A dollar and cents evaluation of the saving that might result from the use of radio is a difficult figure to develop. However, there is no question but that the time wasted by field personnel in the process of reporting in is considerable. To this may be added the saving in mileage that can be realized by the better routing of vehicles. In a well-planned operation the total saving realized will go a long way towards paying for the investment.

That part of the $24 million that the transmission companies have invested in mobile radio equipment is used to help insure a constant supply of gas to the country's distribution companies. This is the investment that provides communication facilities between a pipeline division office or compressor station and the vehicles and crews that are charged with the job of pipeline maintenance. Without a sufficient supply of gas the best service in the world is of no value to a distribution company.

The faulty operation of an automatic shut-off valve, a cracked flange, line leaks, and the possibility of the complete loss of the line because of a blowout can cause the disruption of service to a distribution company. Mobile radio functions for the transmission company to insure the quick handling of any such emergency, as well as the run-of-the-mill maintenance and service operations.

Leased mobile radio service is the same in its function as company-owned mobile radio service. Nearly 17%, or a total of 27 of the 156 companies reporting, use leased mobile facilities. In all but four instances the equipment is leased from one of the common carrier services such as a Bell System associated company.

On a lease arrangement the company has no investment in equipment. When the equipment is leased from a common carrier the service becomes an integrated part of the company's regular telephone service. Maintenance of the equipment is handled by the company from whom the equipment is leased. On a lease arrangement from one of the equipment manufacturers, however, maintenance is handled in a number of ways, depending upon the specific arrangement between the manufacturer and the company.

In making an analysis of the returns from that part of the questionnaire relating to the industry's use of microwave radio, consideration must be given to the fact that at the present time the major users of this service are the long gas transmission lines. This does not mean that microwave has no application to distribution company operation, but only that the transmission companies have led the industry in the use of microwave because of their immediate and urgent need for some form of communication that would closely parallel a pipeline route. There are definite indications in the results of the questionnaire to indicate that distribution companies are looking to the use of microwave for certain of their communication and/or control functions.

Of the 16 companies reporting on the use of microwave radio, a total of 10 are among the top 20 gas transmission companies, all with more than 500 miles of transmission line and revenues in excess of $5 million. This would indicate an even 50% return from the major transmission companies, or about the same percentage return as that received from the total number of companies canvassed. The results might, however, be applied to an estimated 39 gas transmission companies that make up the nation's total count.

The remaining six companies are gas distribution companies with large service areas and some transmission facilities. It is of interest that all but one of the total 16 microwave users also make use of mobile radio facilities.

Of the 10 large gas transmission companies reporting, only one has no microwave facilities. The remaining nine have a total of 271 stations, 7291 circuit miles of system, and 57 channels in operation for a total of 58,898 channel miles. Half of the 10 top transmission companies reporting on microwave had a total investment of $2,833,000.

By projection there is an indicated total investment in microwave radio by the 20 top transmission companies of $11.3 million. This investment is in an estimated 14,500 circuit miles or 118,000 channel miles of microwave system. The actual investment and projection is tabulated in *Table 2* and shown graphically in *Fig. 3*.

Reporting companies all made their existing installations over the past four years. This would indicate an annual expenditure of nearly $3 million over that period. Approaching the total investment figure from another angle, it is estimated by those in the business that microwave radio costs run between $700 and $1000 per circuit mile. Applying this figure to the estimated circuit miles of microwave operated by the 20 top companies results in an estimated total investment of between $10 and $15 million. Again, this would mean an annual expenditure over the past four years of about $3 million.

As to the future expansion of their systems, microwave users offered about the same plans as those using mobile radio service. Five of the 10 major gas transmission companies reporting told of specific plans for the expansion of their system. These plans totalled nearly 1000 miles of additional circuit, plus additional channels and stations. Some companies planned the installation of auxiliary and standby facilities. Two companies now using only mobile service reported that they planned the installation of microwave.

The specific plans offered for the expansion of microwave systems and the building of new systems added up to a total investment of about $850,000. Projecting this figure for the 20 top transmission companies gives an indicated expenditure of about $3 million. This verifies the original estimate based on past expenditures.

The investment and expenditure figures for both mobile and microwave radio are summarized in *Fig. 4*. Bringing together an estimated $24 million figure for investment in mobile radio facilities with an estimated $12 million invested in microwave indicates an industry-wide investment in all types of radio facilities of $35 million. Bringing together the estimated annual expenditures in the same manner indicates a total estimated future expenditure of more than $7 million for all types of radio facilities.

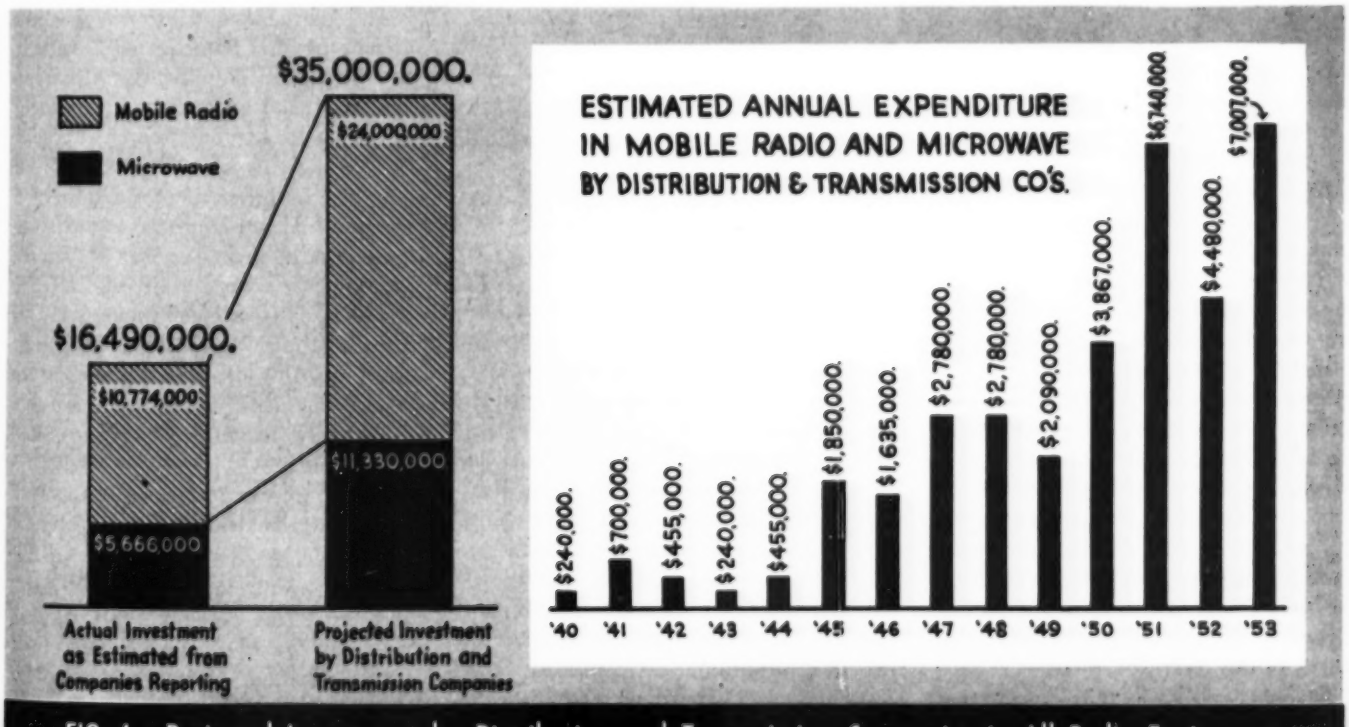
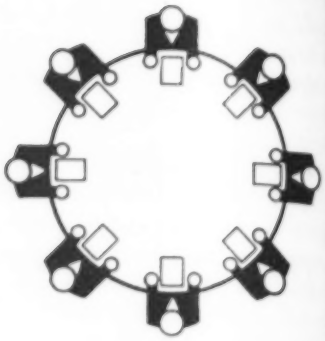


FIG. 4 • Projected Investment by Distribution and Transmission Companies in All Radio Equipment

Cooperation through APWA

Public works men solicit utility aid in bettering public service



By WILLIAM W. CLARK

HOW are your relations with your municipal public works officials today?

Is there a chip on your shoulder?

Are you circling around them warily like a dog spoiling for a fight?

Are you in a state of armed truce?

Or are you sitting down to lunch together and working out some mutual problems for your mutual boss—John Public?

If your answer to the last question is "yes," chances are you are already working with and through APWA. But if your relationships fall somewhere within the bounds or vicinity of the first three categories above, here's a suggestion well worth munching on:

Come join APWA!

APWA, as should be rather easily figured, stands for American Public Works Association, whose headquarters are in Chicago, and if it's not unique in association annals, at least it's highly unusual.

It isn't, for example, a knife-and-fork club. Good fellowship in APWA is good fellowship with a purpose.

It doesn't "talk to itself," as most associations do.

At least one of its local chapters hasn't entertained a motion for three years!

And, perhaps most surprising of all, the president of at least one chapter—the southern California chapter—is a retired gas utility man!

That last statement is the key to APWA's real aim—to bring utilities, including gas utilities, into the fold. It's a situation that might be likened to AMA inviting the patient to join in, and tell the assembled docs what's wrong with him, and with the doctors' methods, or an association of traffic cops inviting speeders in to tell 'em what's wrong with the force.

Except APWA doesn't look at the utilities like a traffic cop looks at a speeder. Mutual suspicion must go,

W. M. Henderson (left), formerly of SoCal, is the first president of the Southern California chapter of the American Public Works Association.

Milton Offner (right), is serving as national president this year.

APWA decided long ago, and that's why the association is actively soliciting membership among utility men the nation over.

"Things have changed in the past few decades," declares Milton Offner, secretary of the Board of Public Works of the city of Los Angeles, who this year is serving as national president of the association. "Years ago the public servant was looked upon as a grafter, or a power-hungry Socialist, or worse. Utilities were seen as grasping, public-be-damned monopolies. Today it's obvious that they are two servants of the same boss—the public.

"In Britain, taxpayers are called ratepayers, the term applied here to customers of a utility. But to my way of thinking, it's all the same. We owe the same duties to the public as the gas utility does—to clear the way for the best service at the least cost. That's the mission of APWA."

Mr. Offner likes to look at municipal rules and ordinances through the eyes of the taxpayer-ratepayer. "If we make a utility unnecessarily spend a dime, it becomes a part of the rates allowed to that utility by the public utilities commission and the taxpayers pay for it.

"We are going to try to direct, through proper channels, the great experience, knowledge, and skills that are available within our association, toward cutting out all unnecessary duplications and needless requirements so that we can all save the taxpayers' money."

Not only utilities, but contractors, suppliers, and manufacturers as well are being brought into the APWA fold.

Milton Offner is in a particularly good position to talk about PW-utility cooperation. While his home chapter did not conceive the idea, it has really pioneered in the effort. Being a relatively new chapter, it was able to organize with this goal in mind, and from the start its main efforts have been directed toward the goal of cooperation.

The northern California chapter (formerly "East Bay chapter") actually got the ball rolling. Several years ago Walter N. Frickstad, then city engineer of Oakland, and Carl Froerer, Alameda city manager, suggested to Mr. Offner that he sparkplug the formation of a southern California group; and furthermore, that he make it a sort of "guinea pig" in the cooperative effort. The northern clan had made progress in this direction, but it was felt that the southern California chapter, starting from scratch on such a basis, would be able to carry the movement along in much faster strides.

Milton Offner was brought up short. Was there actually such a big problem?

"I was amazed to find out," he says now in reminiscing, "that the utilities and contractors were taking the rules in the book that we threw at them, and following them without question. If

GAS staff report

our engineers told them to excavate a ditch in a certain manner and lay gas pipe therein, they followed our instructions even though they may have known a better way to do the job.

"It wasn't until later when we had got acquainted at our chapter meetings that they came back at us and told us we didn't know what we were talking about. After we began to understand and to learn to trust each other, we began to work these things out."

The national association had cleared the way for this campaign in a 1946 amendment to its constitution (then 42 years old), which provided that "any person or firm having special knowledge, experience, or interest in any phase of public works activity shall be eligible for associate membership." The first president of the southern California chapter, organized in 1951, was W. M. Henderson, for nearly half a century a gas distribution engineer, who retired from Southern California Gas Co. in 1950. Mr. Henderson, who has been showered with honors over the years for his many contributions to the advancement of the science of distributing gas, has teamed with Milton Offner and other association officers to spark the movement locally and elsewhere. (Associate members, incidentally, may hold offices in the chapters, but not on the national or regional levels.)

Just what has been accomplished in the three years of the chapter's existence? Nothing, absolutely nothing, if resolutions, official action, or political machinations are the criteria. But plenty, on other grounds, in less tangible ways.

When Bill Henderson says the group hasn't entertained a motion in three years, he isn't confessing, he's boasting.

"Our first order of business was to make friends with the utilities, the oil companies, and contractors," says Milton Offner. "Naturally, there was some suspicion among certain groups, but it has been evaporating rapidly."

Simply getting representatives of utilities and public works together at the same luncheon table is a long stride in the right direction. In one instance, it directly saved one utility (not a gas utility) $30,000 a year, according to Mr. Offner.

Seated together, the utility's man and the city engineer got to chatting in a friendly fashion. The utility's man made an offhand remark about the other being the "fellow who is costing us $30,000 a year." Aghast, the city man pressed for facts. It seemed a certain city work specification was at fault. It wasn't too long before the procedure, which was outmoded, was dropped in favor of a cost saving method advocated by the utility.

Sounds startling?

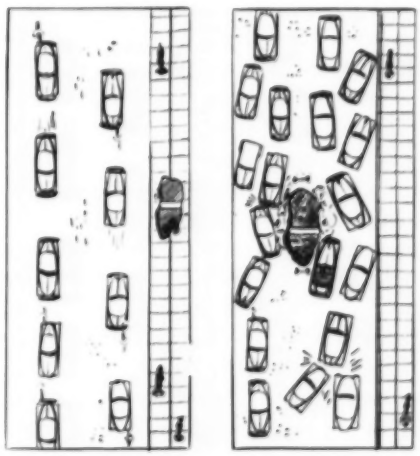
"It's amazing how such misunderstandings can exist," says Mr. Offner. He likes to quote a statement of Sigmund Freud to the effect that "Understanding is more powerful than force." That statement is the motivating force in APWA's campaign for utility friendship.

Another example of accomplishments that have stemmed from the relationship is in the development of a new garbage truck with a plunger mechanism that compresses the materials and increases the payload. The inspiration for this development came from a chance remark at a local chapter meeting.

APWA's campaign has long since passed the friendship-making stage. Having developed a good deal of mutual understanding, it has begun attacking many of the problems that arise in street work and other areas of activity. It might be termed in the "discussion stage." But that's as far as it cares to go; it will not be an "action" group, in the strictest sense of the word, although it may help to establish "suggested" ordinances and procedures. The final authority in such matters is still the municipal government itself.

Matters that come under the association microscope range from legal problems to soil studies, from pipe joints to "force account" vs. contract work, from substructure locations to public relations. The approach is informal, and the members are not averse to giving sacred cows a thorough going-over. As C. C. Westmoreland of Southern California Gas Co., one of the more "active" associates in the organization puts it, "some misconceptions on both sides have been pretty well exploded." Mr. Westmoreland's principal interest has been in tying together the loose ends in street work, where municipal ordinances have lagged far behind modern equipment and techniques to the detriment of the utility and the public as well.

Milton Offner delights in shaking members loose from some old and hallowed conceptions. "Why," he asks, "should sidewalks be sacrosanct?" Why keep utilities buried in the street? If they were placed under the sidewalk, there would be a saving of the difference 4 in. of concrete and from 6 to 8 in. of street surface. Millions of dollars might be saved. And much of today's traffic interference would be transferred to the sidewalk.



"The notion that sidewalks should be kept clear in preference to streets arose when we were a pedestrian civilization. That day is past, and it's time to reexamine the concept."

Problems of utility-city relationships are not all local; for a large utility serving a number of contiguous communities, some of the knottiest questions are those that traverse city boundaries. One city will have certain requirements for street work and its neighbor will have others; and when a pipelaying, trenching, backfilling, or paving job is being done, costly mistakes can occur at the borders. Inspectors may wink at violations of absurd or costly ordinance regulations, but the courts won't, and the

While the accompanying article is slanted toward the West, utility participation in the American Public Works Association is by no means limited to that area. It's simply that this year's national president is from Los Angeles, and that the campaign for more members is being directed from his offices. New Orleans Public Service Inc. is represented; so is Mountain Fuel Supply, and so, no doubt, are others.

President Milton Offner has extended a special invitation to gasmen to join in its annual congress and equipment show, being held Sept. 19-22 in Atlantic City. Further information may be obtained by writing to Milton Offner, secretary, Board of Public Works, Room 162, City Hall, Los Angeles 12.

principals must bear the blame—and costs—for any difficulties that thereafter arise.

Another area of waste, delays, and duplications is in the failure of various companies and groups to coordinate their efforts in construction, maintenance, and substructure work. It's heartbreaking to see a newly resurfaced street torn up for some construction or repair work that should have been attended to before the new surface was laid. Proper coordination removes this headache. In a talk before the convention of APWA in New Orleans last October, Georg Babbe of Southern California Gas Co. urged the chapters to take the lead in seeing that standing committees are formed to handle this coordination.

The southern California chapter's meeting schedule gives a tip on how the association functions. In 1951, the first quarterly meeting of the group was sponsored by the Associated General Contractors, at which time the contractors submitted their viewpoints on the many problems encountered in street work. At the second meeting, the utilities took over to air their troubles with ordinance inconsistencies, and other headaches. Subsequent meetings were conducted by subdividers, public works officials, and others. Presentations were recorded and transcribed for further study by fact-finding committees. Digests were made up for each member; futher action, or discussion, was scheduled as the need seemed to exist. Out of such meetings may evolve uniform ordinance proposals; and while these might be termed "actions," they are merely recommendations with no official authority behind them.

It is up to the municipalities themselves to pick up the ball at this point.

Currently, a subcommittee (chairmanned by J. F. Martinek, city engineer of Whittier) is at work on a standard street use excavation ordinance, and representatives of utilities and contractors are actively participating in this work. APWA has already completed, with the AGC, a national standardized contract document, which is now being adopted everywhere in the United States.

Meanwhile, much more remains to be done. It's a continuing job, this matter of coordination and cooperation among the several organizations that serve the public. Utility cooperation on a nationwide basis is an essential. APWA needs you and wants you.

The latchstring's out. Grab it.

Hot water usage statistics compiled

AN eight-month research project on domestic hot water use just completed at Columbus, Ohio has produced a hatful of statistics of special interest to all companies in the gas utility, plumbing, and home appliance fields The project, sponsored by *Household* magazine with the help of two Pittsburgh equipment manufacturers and Ohio State university, traced the exact amounts of hot water used by an "average" American family over the test period.

Mr. and Mrs. Stephen D. Veirs and their three children used a total of 14,825.4 gal. of hot water in their "average" seven-room home during the test period at a total cost of $20.62, or $2.58 per month—including water, sewage, and gas for water heating.

Gas for water heating cost was only $1.96 a month. Hot water was supplied from a two - temperatures gas water heater produced by Ruud Manufacturing Co.

High-precision hot water meters provided by Rockwell Manufacturing Co. were installed in every hot water line in the house, including lines to the automatic washer, lavatory, electric dishwasher, tub-shower, kitchen sink, and utility sink. Charts were placed beside each meter and the amount of hot water used each time a faucet was turned on was noted.

A breakdown of the Veirs' hot water use during the eight-month period shows that the kitchen sink consumed 2744.2 gal.; the dishwasher, 2562.3; the automatic washer, 1908.2; the utility sink, 463.8; the tub and shower, 4830.4; and the lavatory, 2316.5.

Of the $20.62 total cost, $3.37 represented the cost of the 1982 cu ft of water used, $1.57 the sewage cost, and $15.68 the price of the gas (26,500 cu ft at 61.5 cents per foot).

With the water heater, which has a storage rating of 30 gal. and a recovery rating of 36, Mrs. Veirs found she could wash as many as eight loads without running out of hot water. With her washer located within 6 ft of the water heater, Mrs. Veirs had only a slight drop in temperature in the pipe to contend with. However, whenever she put in a load of room-temperature linens, she recorded a drop of about 10°—and another drop of about 6° when the washing cycle was completed.

A typical set of temperatures would be: 180° in the heater, 178° after the laundry had been put in, and 164° at the end of the washing cycle.

Other findings:

Hot showers required 15.2 gal. of hot water; tub baths require only 11.4, with about 2 gal. less for each in the summer months.

A load of white clothes requires about 16.5 gal. of hot water for a laundering as against 5.7 gal. of cooler water for colored garments.

Cleaning a pair of muddy shoes or galoshes in the utility sink requires an average of 2.9 gal. Other utility sink expenditures include: washing glasses after parties, 4 gal.; washing paint brushes, 12.9 gal.; weekly housecleaning, 42.7.

Men use 3.5 gal. per shave, and a five-member family uses about 7.5 gal. a day for washing hands and faces.

Small-kitchen uses, such as starting the coffee with hot water and soaking pans, total about 6 gal. a day.

Twice as much hot water is used for laundering in summer as in winter months.

The laundry and dryer in the basement of the Veirs home were used in the eight-month test period.

The effect of heating loads on the design of a distribution system

By **JAMES F. GARY, Distribution Engineer** • Seattle (Wash.) Gas Co.

In view of the fact that only recently was Pacific Northwest Pipeline Corp. given the go-ahead on its pipeline, it is particularly timely to consider how Seattle Gas Co. is planning to put its mains into proper condition to receive the gas. Seattle plans particularly to stress the building of its heating load and while at present only 9000 of its 37,000 meters are using gas for heating, the company plans to double this in short order.

ADAPTING existing distribution systems and planning new ones to supply large natural gas heating loads is a problem many gas engineers have faced in the past few years. Our principal problem in Seattle is in connection with our imminent natural gas conversion and the large heating loads to be added.

We operate a manufactured gas utility with some 1100 miles of main. Although our franchise area has a population of more than 700,000 people, we serve only 37,000 meters, resulting in probably fewer meters per mile of mains than any of the relatively large distribution systems in the country. Low pressure mains comprise 80% of our system and are within the city limits. We serve 9000 heating customers. Our gas is a 535- to 550-Btu oil gas and the specific gravity ranges from .55 to .65. We have a heating season of 4500 degree days. Heating systems are designed for 10° F. The ratio of peak day to base day runs between 5 and 6 to 1.

We expect to build our business initially on the domestic heating and interruptible industrial loads. Our five-year projection indicates that 6000 to

"Ideal square mile" for supplying heating loads

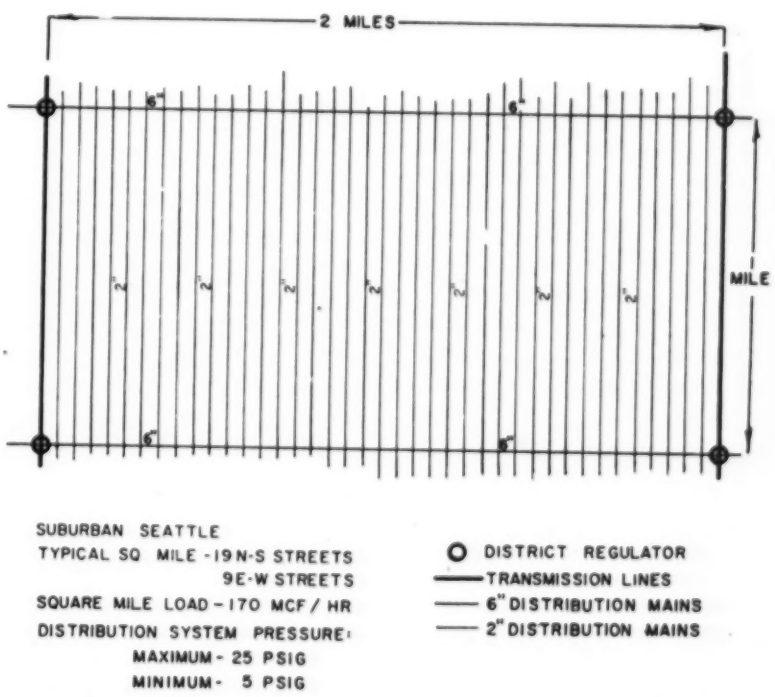


Fig. 1. The ideal dead-end system consists of 6-in. mains, usually east-west, spaced at one-mile intervals, and 2-in. mains on the north-south streets.

7000 heating customers will be added to the 9000 now served. These heating loads obviously will have considerable effect on system design problems. Although we currently operate an underdeveloped system we will soon run out of main capacity. We expect to be selling six to seven times the current annual thermal load. Our estimates of the peak hour require moving nearly three times the present cubic foot volume of gas into domestic areas by the fifth year after conversion. Therefore, a very careful evaluation of both high and low pressure systems is essential in order that system design standards and construction estimates for meeting consumer requirements may be prepared.

High pressure system design

Evaluating our high pressure districts compared to the low pressure areas is relatively uncomplicated because the high pressure system is not a gridwork. It is mainly a "dead end" type of system composed of fingers extended out from the city. Approximately 20% of our mains are high pressure, operating at pressures of 10 to 60 lb. New main construction to the extent of several hundred miles will go into these high pressure districts, all suburban areas.

"Ideal" square-mile design for heating loads on high pressure systems

Loads are estimated on a square-mile basis. After some study and calculating we selected an "ideal" square mile that is a self-sufficient, dead-end system for supplying these large heating loads. As shown in *Fig. 1,* it consists of 6-in. mains, usually east-west, spaced at one-mile intervals, and 2-in. mains on the north-south streets. This system would be a complete gridwork as shown in *Fig. 1* only when fully developed by customers. The 6-in. main is fed at 2-mile intervals along its length. With 25 psig at the feed points and taking a 20-psi pressure drop, this system will distribute 170 Mcf/hr. This is more than 100% saturation for most residential square miles. This compares with a similar design in AGA literature in which 154 Mcf/hr was distributed at 20 psig maximum and a 15 psi pressure drop.

Modification of ideal pattern

In its application, this ideal grid pattern must be superimposed over existing mains and topography and modified so that eventually it can supply the potential load in each square mile. Certain square miles containing commercial development naturally require more gas. In these areas, 4-in. or 6-in. mains will be used in place of 2-in. Terrain features will also affect the design with hills, parks, lakes and golf courses creating areas in which this arrangement cannot be followed. There will be some dead-end streets requiring larger mains.

This ideal square-mile system is practical in that it can be constructed in portions only as consumer demands make it necessary. At times the 2-in. main will be gridded to correct pressure conditions where load growth is not in accordance with the ideal plan.

Sample low pressure square mile

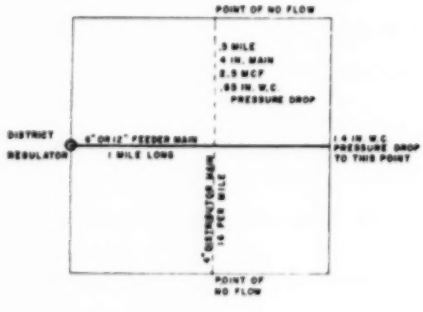

POINT OF NO FLOW
.5 MILE
4 IN. MAIN
2.5 MCF
.55 IN. W.C. PRESSURE DROP
DISTRICT REGULATOR
6" OR 12" FEEDER MAIN
1 MILE LONG
1.0 IN. W.C. PRESSURE DROP TO THIS POINT
4" DISTRIBUTOR MAIN 10 PER MILE
POINT OF NO FLOW

Fig. 2. Logical points for district regulators were selected based on estimated heating load additions.

An initial distribution system development of 6-in. mains spaced at 2-mile rather than 1-mile intervals will supply a square mile up to approximately 40% saturation, leaving room for orderly, planned development.

Evaluating low pressure systems

Low pressure systems have no place in present-day distribution design for natural gas heating loads. Nevertheless, existing low pressure systems must be adapted to meet new consumer demands. Existing systems represent extensive investments and have many useful years ahead.

Low pressure system evaluation is complicated. Ours is a typical gridwork with tie-ins at nearly every block. It is all cast iron with lead joints. Like most systems built prior to the gas heating era, it is composed of large quantities of 4-in. main and a fair amount of 6-in. main all fed from a backbone of 12-in. main supplied at intervals by district regulators and the holders.

As a low pressure system or any portion of it becomes inadequate for a planned increase in load, there are three general methods for increasing its adequacy:

1. *To increase the allowable pressure drop across it.* The practical limitations on this are related to appliance operation, more specifically to range difficulties. Appliance regulators with their hard seats do not control pilot flows adequately through the wide pressure variations needed for serving large heating loads. A recently developed soft seat appliance regulator may be a good solution for this problem. If this, or a similar device, would give good pressure control on an appliance at small pilot flows and if it were to be used on all appliances, system pressures could be raised to 20 or 25 in. over the heavy load periods for a few peak days and large capital expenditures possibly could be deferred.

2. *Convert the low pressure system or portions of it to higher pressures and install a regulator on each service.* With service regulators costing $6 or $7, and considering the labor involved and the practical problems of leakage at higher pressures on old cast iron lead joints, this can become difficult and expensive. In our particular system, pressures can be raised at a moderate valving cost as it becomes desirable, since sectionalizing valves will have been installed for conversion to natural gas.

3. *Add more district regulators.* By this method more volume can be distributed without increasing the pressure variation across the low pressure system. We plan to use this method extensively because of the shape of our service area. It is 28 miles long on the north-south axis and roughly four miles wide, varying from two or six miles. The gas plant is at the center and supply mains extend north and south from it. The natural gas supply mains will be laid north and south through the heart of the area from the ends toward the center. District regulators can be established without having to lay many lengthy laterals. We plan to permit a 2- or 3-in. pressure drop across our low-pressure gridwork.

Evaluating district regulator locations

To evaluate individual district regulator locations we have developed a rather simple but perhaps unique method using an ordinary low pressure gas flow computer. Having estimated the proposed heating load addition required to be supplied in each square mile of similar unit area of the low pressure system, we have selected logical points for district regulators. These are pri-

cipally at the intersections of larger mains, that is 6 in. or more. The procedure for evaluating a particular location resolves into two parts:

(a) Determining the capacity of the feeder mains leading away from the regulator.

(b) Determining the capacity of the distributor mains leading away from the feeder main.

The smaller of the two items is the capacity limit of the main system supplied by the regulator. The consumer demand to be supplied from the proposed regulator can be no larger than this capacity limit. Referring to *Fig. 2*, if this capacity of the feeder main is greater than that of the distributor mains leading away from it, the regulator discharge into the feeder can be no larger than the distributor main capacity. If the capacity of the feeder is less than that of the distributor mains, the distributor mains are assumed to be capable of receiving the full capacity of the feeder.

TABLE 1. CAPACITY OF FEEDER MAINS

With 1.4 in. wc pressure drop and 10 or more distributor mains.)

Distance to Point of No-Flow Miles	12-in. Feeder, cfh	6-in Feeder, cfh
.2	90,000	16,000
.5	55,000	10,000
1.0	40,000	7,000
1.5	32,000	5,400

Application to an existing low pressure system

The practical application of this method may be understood by referring to *Fig. 2*. Assuming a pressure drop of 1.4 in. wc from the regulator to a no-flow point on the 6- or 12-in. feeder one mile away and that a sufficient (10 or more) number of distributors exists to carry away the feeder capacity, the regulator will supply 40 Mcf/hr to a 12-in. feeder and 7 Mcf/hr to a 6-in. feeder. The remainder of the permissible pressure drop is taken on the distributor mains and the services. With .65 in. wc pressure drop in the distributors, the maximum pressure drop in the square mile is 2.05 in. wc.

If load estimates require larger deliveries to a feeder, the no-flow point has to be moved closer to the regulator by adding another regulator to assist in supplying the square mile or by obtaining gas from a regulator location in an adjacent square mile that is over-supplied. It is a simple matter to set up a table using the section scale on a flow computer to show the capacity of a feeder for supplying an area, assuming 10 or more distributor mains lead away from the feeder (see *Table 1*). If less than 10 distributor mains are attached to the feeder main, the above capacities must be reduced by using the section scale.

Most low pressure square miles in our system indicate they will require an average of slightly more than two district regulators to supply consumer demand in our five-year projection, and will have an average capacity of 114 Mcf/hr. Estimated loads in some square miles, particularly downtown and in apartment house areas, run well over this figure and in some approach 300 Mcf/hr. These areas require more than two regulators and fortunately have a higher percentage of larger mains.

Preferential district regulator locations

It is apparent from these comments that a preferential order of district regulator locations may be expressed relatively as shown in *Table 2*. This assumes that the same effective length of feeder mains and distributor mains exist.

TABLE 2. PREFERENTIAL ORDER OF DISTRICT REGULATOR LOCATIONS

Feeder Mains Junction Size (In.)	Relative Capacity of Gridwork, Mcf
12 x 12 x 12 x 12	160
12 x 12 x 6 x 6	94
12 x 12	80
12 x 6	47
12	40
6 x 6 x 6 x 6	28
6 x 6	14
6	7

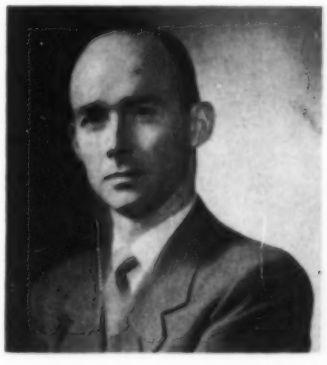
This procedure is a practical method for applying a flow calculator to a low pressure system without the necessity of a complicated balancing of each square mile. It should result in a conservative design containing a sufficient quantity of district regulators since no allowance is made for gas moving through lateral mains parallel to a feeder main unless they are fed from another feeder main from the same regulator.

Conclusions

An obvious conclusion is that more gas can be distributed by a district regulator feeding from the end of a single 12-in. main than from a 6-in. cross feeding in four directions.

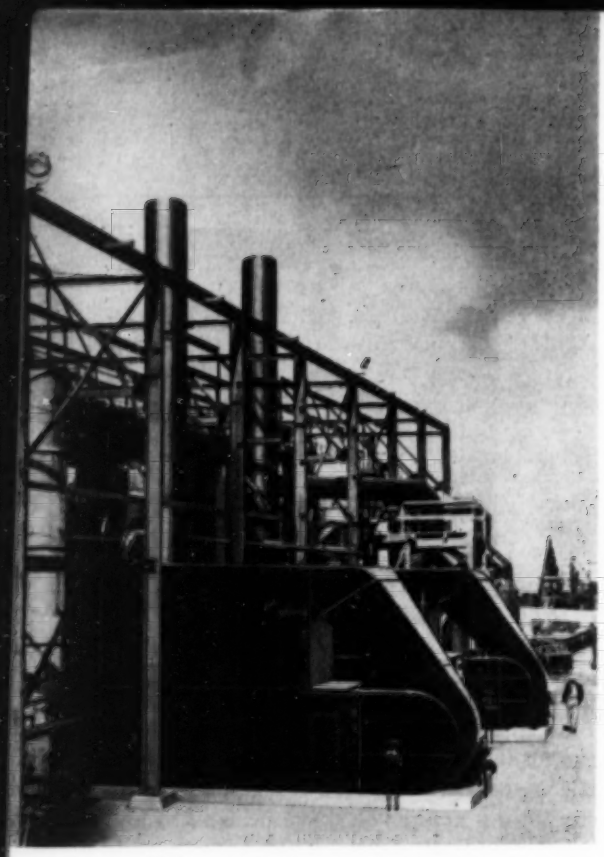
A second conclusion, well known in practice to many distribution system operators, is that most existing district regulators are tremendously oversized for the capacity of the gridwork they supply. The old-time practice of installing a 6-in. regulator because it is attached to a 6-in. main can hardly be justified unless exceptionally low inlet pressures exist.

Finally, it is apparent that establishing a high pressure belt line with district regulators reinforcing a low pressure system from the fringe edges does not take full advantage of the capacity potential of the existing gridwork. The maximum permissible pressure drop can occur in only one direction instead of two or more, thus limiting the load that can be added.



Mr. Gary joined Seattle Gas Co. in 1947 as a cadet engineer at the gas plant. Since then he has worked successively as pressure control foreman, assistant distribution engineer, and distribution engineer. He is currently responsible for distribution system engineering, construction work by contractors, and pressure control operations.

Mr. Gary has adapted this article from comments presented in a panel discussion at the PCGA distribution conference held in San Francisco recently.



Installation of several self-recuperative units.

Gas clears the air

In conjunction with catalytic combustion, gas can help eliminate pollution and simultaneously provide recovery of "waste" heat on a 20-to-1 ratio.

By R. J. RUFF, President • Catalytic Combustion Corp., Detroit

IN THE past, fuel engineers have invariably dismissed the utilization of gases having energy concentrations below the lower limit of flammability as having inconsequential economic value. Usually such gases are considered as "waste-gas," "off-gas," or "fumes," to be discharged to the atmosphere. With the increasing growth and concentration of industry, the volume of such fumes constitutes a significant portion of the growing air pollution problem, which plagues our major urban areas. Fume destruction equipment is currently creating a new market for the economical utilization of gas fuel, as industry and the public become increasingly aware of the need and availability of suitable control measures. Through the use of catalysis, the "iron curtain" of "lower flammability limit" has been cast aside, making it possible, and frequently profitable, to convert vapors of low energy concentration to harmless, color-free and odor-free gases.

The installations that have been placed in operation since the introduction of the catalytic combustion process about five years ago show conclusively that predictions on future gas consumption for an industrial community must not overlook the fuel demand needed to accommodate the impact of stricter air pollution control regulations. Any attempt to estimate the expected gas demands on an area-wide basis may be premature. However, we may outline the position of gas preheating in catalytic fume combustion in a manner that will permit the fuel engineer to make a preliminary survey of the adaptability of catalysis to individual fume liberating systems, to estimate the external heating demands, and to explore possibilities for heat utilization.

Basic principles of catalysis have been extensively covered in earlier studies. From a combustion engineering standpoint, the catalyst element can simply be considered as a "burner" of a type that will permit low temperature combustion to sustain itself at concentrations below the flammable range, down to traces, while conventional burners depend upon their performance for the handling of gases within the flammable range. It also appears unnecessary to repeat construction details of the catalyst element itself and performance dependability on specific fume streams. Suffice it to say that more than 400 installations of catalytic combustion equipment are proving the ability to consume a wide range of hydrocarbon, organic, organic-sulfur and nitrogen compounds in a gas, fume, or aerosol phase. Dependability appears to be well demonstrated by the substantial number of units that have now passed 20,000 operating hours, each, without requiring service to catalysts beyond normal customer maintenance.

So as to simplify presentation of the data, it is appropriate that we review here briefly the energy concept of fumes. The thermal capacity of dry air at 70° F is equal to 0.0181 Btu per cubic foot per degree F. Conversely, the release of 1 Btu of heat energy into 1 cu ft of 70° F air (or its equivalent) produces a temperature rise to that air of 55° F. Therefore, a fume stream having a unit energy concentration of 10 Btu scf, when preheated to 500° F —the usual catalytic ignition temperature—will be discharged from the catalyst at approximately 1050° F, with the combustible constituents being discharged as innocuous CO_2 and H_2O. Ventilation practices from volatile liberating operations usually provide for a dilution to one-fourth of the lower limit of flammability, or approximately 13 Btu scf for most hydrocarbons; and the release of this latent energy by catalysis produces a temperature rise of 715° F. It can be seen, therefore, that process exhaust gases, maintained within the conventional limits of safe ventilation practice, may contain considerable latent energy.

To predetermine the gas discharge temperature following catalytic processing of fumes, let us assume that a continuous paint baking oven volatilizes solvents from the work at a rate of

This article has been adapted from a talk presented at the AGA industrial and commercial gas sales conference held in Chicago in April.

10 gal. per hour and exhausts to the atmosphere 3000-cfm of 300° F oven fumes. Assume the heat of combustion of the solvents to be 120,000 Btu per gallon:

Total latent energy—10 × 120,000 = 1.2 million Btu/hr

Equals—20,000 Btu/min.

Scfm gas volume (cfm at 70° F)—

$$3000 \times \frac{460 + 70}{460 + 300} = 2090 = \text{scfm}$$

Unit fume energy concentration—

$$\frac{20{,}000}{2090} = 9.6 \text{ Btu/scf}$$

Temperature rise through catalyst—

$9.6 \times 55 = 528°$ F

When considering the application of catalysis, it is convenient to classify the fume stream into one of several broad groups:

1. *Where the three design factors of volume, temperature, and fume energy concentration, under normal operation, remain generally constant.* Such conditions usually exist in the exhaust from continuous coating ovens, wire-enameling operations, organic chemical processes, and refinery operations, and in the destruction of odors, toxic gases, bacteria and virus from sewage concentration tanks, and vents from pharmaceutical or similar manufacturing operations.

2. *Where exhaust volume and temperature remain generally constant, but energy concentration is subject to wide fluctuation.* Typical examples are the exhaust gases from batch-type industrial ovens as used for baking paint finishes, foundry cores, electrical insulations, and vents from intermittent oil quenching operations.

3. *Where all three influencing factors are subject to considerable variation.* Best examples are represented by the exhaust gas from kettle cooking operations as used in the production of paint vehicles, and other batch cooking of animal, vegetable, and mineral oils, or asphalt blowing, and intermittent blow-down for removal of combustible accumulation in stills, chemical dryers, and adsorbers.

Because of the three functional variables of temperature, volume and energy concentration, it becomes obvious that each system requires careful engineering study as to normal and abnormal exhaust conditions, in order to provide a complete combustion system best adaptable to the individual application. Initially, it appeared necessary to depart from the modern concepts of design standardization with attendant economies. Standardization has, however, been attained in the form of basic types and sizes of fume combustion systems. An example illustrating correlation of data thus obtained is revealed by the curves in *Fig. 1.* Such information is currently used as a basis for selection of proper type systems, determination of heating cost, and potential recovery, on those individual fume streams where volume, temperature and energy concentrations are essentially stable. This chart, covering the usual range of energy concentrations, has been divided into three main areas for basic system design standardization. Use is related to continuous type operations where interruptions are infrequent and normally of short duration.

Area "A" of *Fig. 1* encompasses the continuous low temperature, low energy exhaust fumes, including noxious and toxic odor destruction problems, where the patented Type S-R system is employed. (S-R stems from self-recuperative systems, in which the oxidized gases are returned, in heat exchange relationship to the incoming fume stream, before being discharged to stack, as illustrated in *Fig. 2.* In this way, cold fumes can be preheated up to, or near, the catalyst ignition temperature without external heat, once the process has been started.)

A typical cross-section of this system is shown in *Fig. 2,* and several units in operation are shown in the photograph on the first page. Economy in operation of the S-R system is attained through use of the oxidized gases following catalysis for indirect preheat of the incoming fume stream. As can be seen from *Fig. 1,* the maximum fuel demand for a practical installation might occur in handling trace concentrations of odors, having essentially no fume energy, and entering the system at approximately 70° F.

The external fuel consumption to accomplish approved air pollution control under these conditions is approximately 4 Btu/scf of fumes handled. Consumption reduces as either the process exhaust temperature, or its energy concentration, is increased. The maximum consumption figure presents a surprising contrast to possible direct heating methods for organic odor destruction through non-catalytic, non-recuperative means, where heat input would increase to more than 20 Btu per scf of fumes handled. *Fig. 1* also shows that a process exhaust stream at 300° F containing 2 Btu/scf, is essentially self-sustaining once placed in operation, and requires little or no fuel

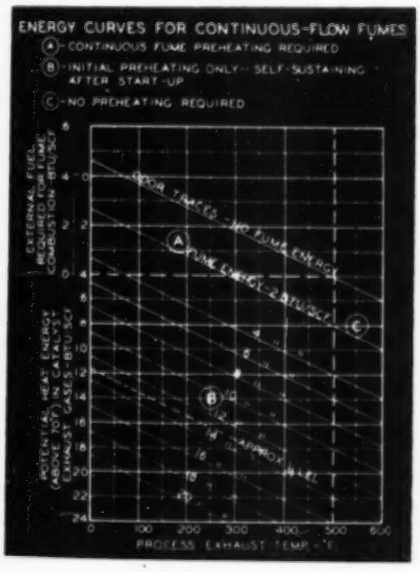


Fig. 1.

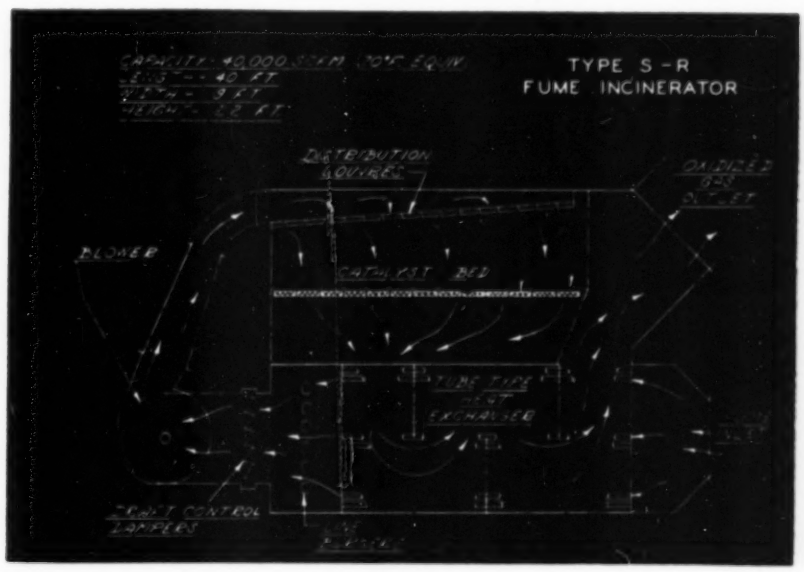


Fig. 2.

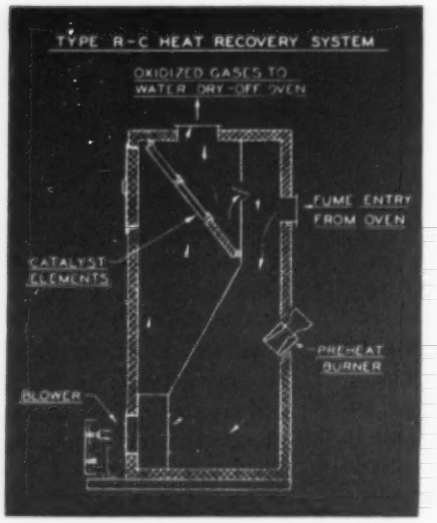


Fig. 3.

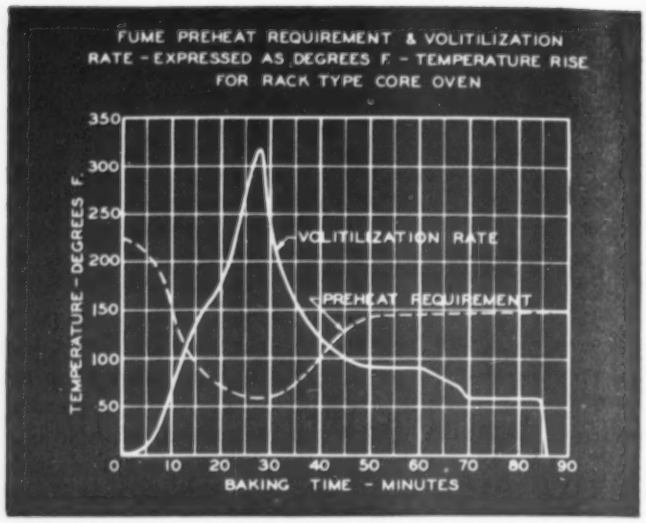


Fig. 4.

consumption except for starting operations, and fume energy interruptions. S-R type units are in operation having capacities to 25,000 scfm, and a unit of 40,000 scfm capacity is presently under construction.

Area "B" of *Fig. 1* shows the range covered by the larger number of industrial applications, where profitable heat recovery through fume preheating exists. It is in this area where the purchase of 1 Btu of gas fuel may return to the user up to 20 Btu or more, for re-use either within the fume liberating equipment itself, or in adjacent equipment, for plant make-up air heating, or steam generation. The exhaust from conveyorized core and paint-baking ovens, paper or textile impregnating and coating, and other high-volatile continuous operations are typical examples. Initial gas preheating raises the fume stream from its exhaust temperature to approximately 500° F for catalyst ignition. Thereafter, the heat released by catalysis reduces the preheat burner to pilot operation. Typical of the systems designed for fumes in this area is the standard Type R-C unit, as outlined in *Fig. 3*. (Type R-C is derived from our recycling system, as illustrated in *Fig. 3*, where a part of the oxidized gases, after coming off the catalyst at high temperature, are returned to assist in preheating the colder entering fumes.)

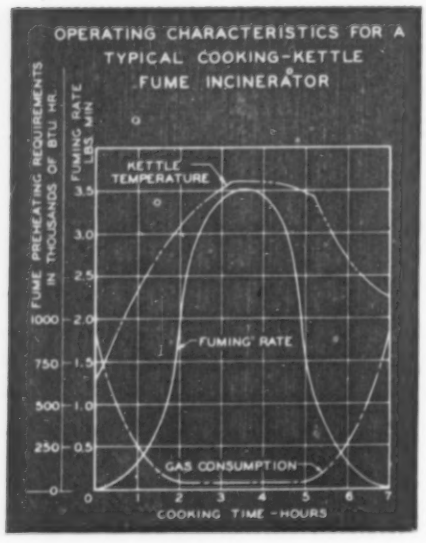

OPERATING CHARACTERISTICS FOR A TYPICAL COOKING-KETTLE FUME INCINERATOR
FUME PREHEATING REQUIREMENTS IN THOUSANDS OF BTU HR.
FUMING RATE LBS. MIN
KETTLE TEMPERATURE
FUMING RATE
GAS CONSUMPTION
COOKING TIME - HOURS

Fig. 5.

Here, the exhaust fumes are being withdrawn from a paint-baking oven operating at 300° F and a fume energy concentration of 12 Btu/scf. After starting, with burner at pilot setting, the gases leave the system at approximately 950° F, and provide the necessary heat for an adjacent continuous water dry-off oven. Within the R-C system, a small amount of the hot oxidized gases are recycled, thereby sustaining required catalyst entry temperature. Installations of this type frequently provide substantially more heat than is required for the water dry-off operation, and the excess may be diverted to other heating operations.

Area "C" of *Fig. 1* is confined to those fume streams that are constantly exhausted at temperatures in excess of the required catalytic ignition temperature, and where no fume preheating is required. Such conditions occur in the exhaust of horizontal wire-enameling ovens, oil burn-off ovens and furnace de-waxing operations. Where the processing equipment is maintained at these higher temperatures, it is frequently advantageous to place the catalyst directly within the air circulating system of the oven, furnace or kiln, thereby reducing the process fuel required. As an alternate arrangement, a simple insulated housing containing the catalyst is mounted on the exhaust stack, and heat recovery to other equipment or make-up air is accomplished thereafter.

Intermittent or fluctuating fume applications

Batch type core-baking, paint, and similar intermittent drying and curing processes are typical applications where the temperature, and more influentially, the fume concentration, is subject to wide, cyclic variations. Incidentally, these batch operations are frequently subject to the most serious complaints from the neighborhood since the peak concentrations are usually high, and the surging release prevents "conditioning" the neighbors to a constant odor level. A typical volatilization rate curve for a batch-type core oven, with superimposed preheat requirements utilizing a modified Type R-C system, is shown in *Fig. 4*. While such a system frequently offers only limited opportunities for heat recovery, the combustion of the fumes offers other advantages to the user, quite aside from air pollution control. Condensate is eliminated in the exhaust ducts, thereby minimizing fire hazards and consequent maintenance. Excessive oven ventilation, or inadequate safety ventilation, is avoided through the use of the catalyst discharge temperature for volume adjustment, or limit protective circuits.

While it is obvious that greatest heat utility from catalysis can be accomplished on fume streams having generally stable conditions, the preheat burner, with proper controls, can be employed to compensate for any momentary deficiency in latent energy of

the fume stream itself. In this way, constant catalyst discharge temperature can be maintained where demanded by the heat recovery process.

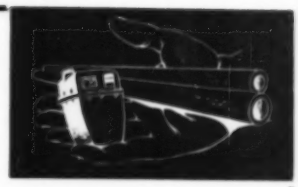
The catalytic combustion process is not necessarily limited to fume streams that are constantly below the lower limit of flammability. As an example, the exhaust gases leaving closed or open reaction kettles, such as frequently used in the processing of oils, in asphalt blowing and similar operations, are subject to wide variations in temperature, volume and energy concentration throughout the heating cycle. During a portion of the cycle, these gases may be far beyond the upper flammable limit. A typical fuming rate curve, with superimposed gas consumption curve through the cooking cycle, is shown in *Fig. 5*. The fuel consumption curve shown applies for the use of a modified R-C system. The range of controllability, wide fluctuation in fume energy concentration and necessary turn-down ratio for gas preheating equipment, is self-evident from the curves.

Summary

As recently as 20 years ago, air pollution was hardly recognized as a problem in this country, except perhaps as occasioned by the smoke from a passing locomotive. Within the past few years, as a result of the ever increasing and more noxious smogs that plague our major cities, many industry associations and technical societies have organized air pollution committees to investigate various sources of air contaminants, establish methods of measurement, tolerance levels, and explore methods of correction. These groups have done much to encourage and effect the installation of air corrective equipment on a voluntary basis. Valuable as these activities have been, expanding production continues to outstrip air-corrective steps, and restrictive legislation is widely being enacted or considered. Consequently, interest in correction equipment will continue to increase over the coming years.

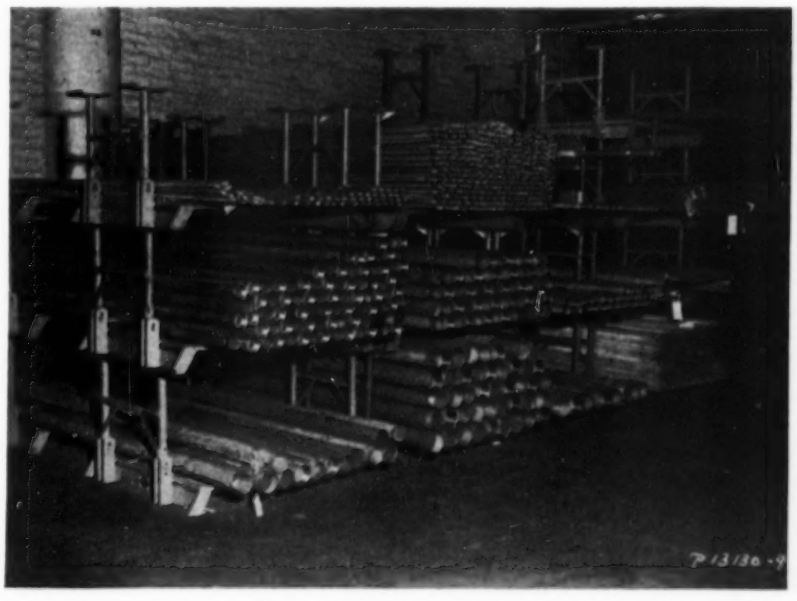
Where mechanical filters, water scrubbers, and electrostatic precipitators have over the years assumed their rightful position for collection of various inorganic contaminants, catalysis is rapidly gaining similar acceptance in the destruction of organic pollutants. The gas industry can take a vital part in this expanding program by guilding the effective and economical use of fuels for clearing the air.

SHORT CUTS IN MATERIALS HANDLING: **1**



The multi-stack pallet stacker unit

The multi-stack pallet stacker or portable storage rack shown here is 40 in. wide, 36 in. long with a vertical clear space of 25 in. The uprights fold down to facilitate shipping and compact storage when empty. It is designed for a 4000-lb load (stacking capacity, 20,000 lb) and occupies approximately 10 sq ft. The bottom picture shows Consolidated Edison Co. of New York's use of the metal stacking pallets as a pipe rack.



—Photos courtesy of AGA Materials Handling Subcommittee.

Shelling out on a large scale

Gas industry schedules four-year construction outlay of $3.9 billion

DURING the four years, 1954-1957, total new construction expenditures by the gas utility and pipeline industry will aggregate $3.9 billion, the American Gas Association reports. This compares with actual expenditures of about $5.08 billion on the expansion program of the industry in the 1950-1953 period.

Expenditures of the industry in 1953 for new facilities aggregated $1.35 billion, the second highest total in gas industry history. Last year was the fourth consecutive year in which new construction expenditures exceeded $1 billion.

Total expenditures for new construction and expansion of present facilities for 1954 are estimated to be about $1.2 billion, with expenditures of $1.15 billion for 1955. Industry estimates for 1956 and 1957 are placed at about three-quarters of a billion each year.

These estimates may prove conservative, since many companies tend to under-estimate construction projects for the more remote years. Although in the post-war years the ratio between available supply and demand for natural gas has gradually lessened, there are many factors indicating further growth of demand for gas. More large pipeline projects will be needed to supply industrial and population growth. Although construction expenditures may decline, the reduction from current levels may be more moderate and gradual than indicated in the present estimates.

About 90% of the estimated construction expenditures for the next four years, or a total of about $3.6 billion, will be devoted to expansion of the nation's natural gas systems. About $1.71 billion will be spent on natural gas transmission lines and utilities distributing natural gas will spend $1.33 billion for expanded distribution facilities. Natural gas construction expenditures in 1953 totaled $1.25 billion and it is anticipated that about $1.09 billion will go for natural gas construction in 1954.

For the whole gas utility and pipeline industry, transmission expenditures will amount to $1.72 billion from 1954 through 1957. About $1.6 billion will be spent on all types of distribution and $114 million will be spent in expanding underground storage facilities in the next four years. The distribution expenditures for the 1954-1957 period are greater than in the comparable period from 1950-53, when about $1.4 billion went into expanded distribution facilities.

A large proportion of the companies reporting anticipated construction expenditures also indicated their expected methods of financing. Such estimates showed these companies expected to obtain 35% of the needed funds from internal sources; 47% of the new money would come from debt issues and the remaining 18% from equity issues.

This authoritative study lends further credence to the findings in the GAS magazine survey of construction budgets, published in the May 1954 issue, which clearly showed that expansion in the gas industry will remain at levels approaching the fantastic growth of the past four years. Although the sources and methods of compiling the two surveys differed materially, both arrived at a figure of approximately $1.2 billion for 1954.

As pointed out in the AGA study, estimates usually err on the conservative side, so the moderate slackening in tempo anticipated may be materially reduced as the actual construction unfolds.

It is significant to note that outlays for distribution facilities will actually increase under the impact of new major construction programs of long-distance transmission lines.

TABLE 1. GAS UTILITY AND PIPELINE CONSTRUCTION EXPENDITURES, BY TYPE OF GAS AND BY PLANT FUNCTION, 1953-1957

(Millions)

Type of Gas and Plant Function	Actual 1953	Forecast 1954	1955	1956	1957	Total Forecast 1954-1957	Actual Total 1950-1953
Natural gas—total	$1252	$1088	$1055	$ 709	$ 699	$3551	$4587
Production and other storage	172	74	67	54	56	251	509
Transmission	673	613	568	260	267	1708	2746
Underground storage	44	50	24	27	13	114	155
Distribution	315	312	357	331	331	1331	1109
General	48	39	39	37	32	147	168
All other types of gas—total	98	107	97	89	71	364	390
Production and storage	17	22	19	18	17	76	88
Transmission	7	5	3	3	1	12	19
Distribution	68	70	70	62	50	252	260
General	6	10	5	6	3	24	23
Total industry—total	1350	1195	1152	798	770	3915	5077
Production and other storage	189	96	86	72	73	327	597
Transmission	680	618	571	263	268	1720	2765
Underground storage	44	50	24	27	13	114	155
Distribution	383	382	427	393	381	1583	1369
General	54	49	44	43	35	171	191

Efficiencies and recovery rates established in competitive water heater tests

By PROF. EUGENE F. HEBRANK • University of Illinois, Urbana

THE greatly increased use of household appliances that consume considerable quantities of hot water has led to a marked increase in the interest in the production of hot water for the home. This interest is being shown by the consumer as well as by the manufacturers of domestic water heaters. To satisfy this interest and to make available engineering performance data on water heaters, the committee on comparison of competitive services of the American Gas Association established a comprehensive research program late in 1951 in the Engineering Experiment Station of the University of Illinois.

These studies have now been completed and an Engineering Experiment Station bulletin will shortly be forthcoming.

Equipment tested

The performance tests included in this program were conducted on commercial models of commonly used comparable and representative automatic, storage-type, gas and electric domestic water heaters. Six gas heaters representing both external and internal flue types and having nominal tank capacities ranging from 20 gal. to 50 gal. were studied. The gross heat input rates ranged from 20,000 to 42,900 Btu per hour. The seven electric heaters ranged in size from 30 gal. to 80 gal. nominal tank capacity, and their input rates ranged from 1600 watts to 5000 watts (5460 to 17,065 Btu per hour).

In a paper presented before this group last year the test procedure was fully outlined and consequently this material will not be repeated. However, it seems necessary to repeat the list of studies that were made and then some general results of these studies can be discussed.

1. Standby studies.
2. Maximum hourly and two-hourly delivery studies.
3. Daily usage studies.
4. Automatic washer cycle studies.

Results

The standby studies showed that the daily required input for the gas water heaters was, on the average, approximately 23,000 Btu per day. This ranged from a low of 17,900 to a high of 27,600 Btu per day. The average for all of the electric heaters was approximately 9100 Btu per day with a range from 6690 to 11,380 Btu per day. This amounts to an average of about 820 Btu per day per gallon of actual capacity for all gas heaters to 170 for all electric heaters. Approximately five times as much heat is required by the gas heaters as is required by the electric heaters to maintain a tank full of hot water without any withdrawal.

The one-hour delivery studies showed an average recovery efficiency, ie., ratio of heat utilized in heating water to heat input, for the gas water heaters to be 76% to a comparable value of 93% for the electric water heaters. The one-hour delivery for a 90° F temperature rise varied widely because of the wide variation in tank capacities and gross heat input rates. However, on a comparable figure, namely, gallons delivered per gallon of actual tank capacity, the gas heaters showed a value of 1.88 as compared to 0.94 for the electric, or twice as great an output for the gas heaters. The required heat input per gallon of hot water delivered was found to be 1000 Btu for the gas as compared with 800 Btu for the electric.

"The automatic clothes washer studies showed that all of the gas water heaters except the 20-gal. heater satisfactorily supplied hot water for four consecutive washer cycles whereas only the 80-gal. electric heater satisfactorily supplied hot water. The required input per cycle for the gas water heaters was approximately 22,500 Btu, as compared with a requirement of approximately 15,900 Btu for the electric water heaters, or an energy ratio of about 1.41:1."

Two-hour studies

The two-hour delivery studies showed the same recovery efficiencies whereas the delivery per hour per gallon of actual tank capacity was found to show 1.50 to 0.62, or about 2½ times

This article has been adapted from a report presented at the AGA research and utilization conference held June 2-3 in Cleveland.

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(Rate 5 GPM)

Total Daily.....

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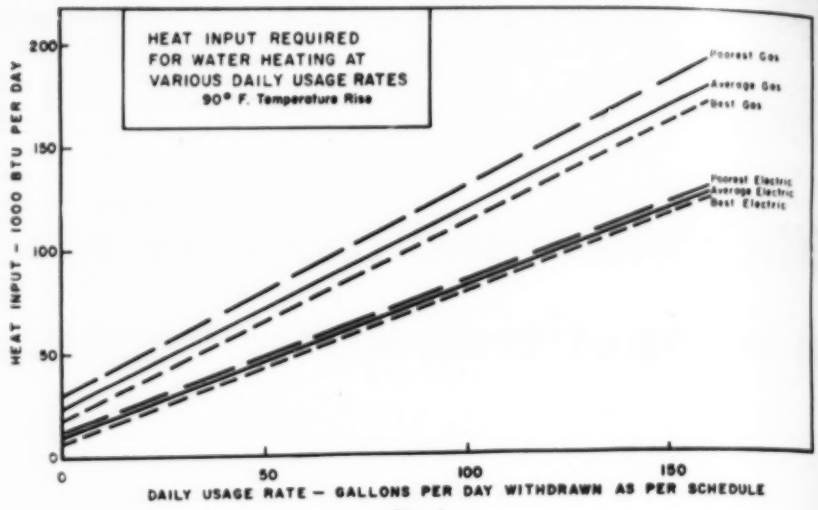
6:30 a.m.	11
7:30	5
8:00	17
9:00	14
10:00	13
11:00	4
12:00 noon	4
1:00 p.m.	7
5:00	3
6:00	4
7:30	5
10:30	13
	100%



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as much output from the gas as from the electric water heaters. The required heat input was the same as found in the one-hour tests.

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Fig. 2 shows the required heat input for variable daily usages of water heated through a 90° F temperature rise and withdrawn in a 24-hour day as specified in the predetermined draw-off schedule. This figure shows average values for the gas and electric water heaters over a range of 50 to 150 gal. daily usage. This range is shown because most of the heaters performed satisfactorily over this range. It also shows curves of heat input for the most efficient and least efficient heaters of each type. It will be noted from these curves that the poorest electric heater required less heat input than the best gas water heater.

Fig. 3 shows the same series of curves for service efficiency against daily usage rates. The service efficiency may be defined as the ratio of the heat utilized in the hot water delivered compared to the heat input per day to heat this delivered water as well as the heat required to maintain the tank full of hot water.

In *Fig. 4* the energy ratio, i.e., the ratio of required Btu per day heat input of the gas water heaters to the required Btu per day input of the electric water heaters, is plotted against daily usage rates. The center curve is the average of all the gas water heaters compared with the average of all electric water heaters. The upper curve is a comparison of the poorest gas to best electric while the lower curve shows the best gas as compared with the poorest electric. It can be seen that the average ranges from about 1.6:1 at 50 gallons per day to about 1.4:1 at 150 gallons per day.

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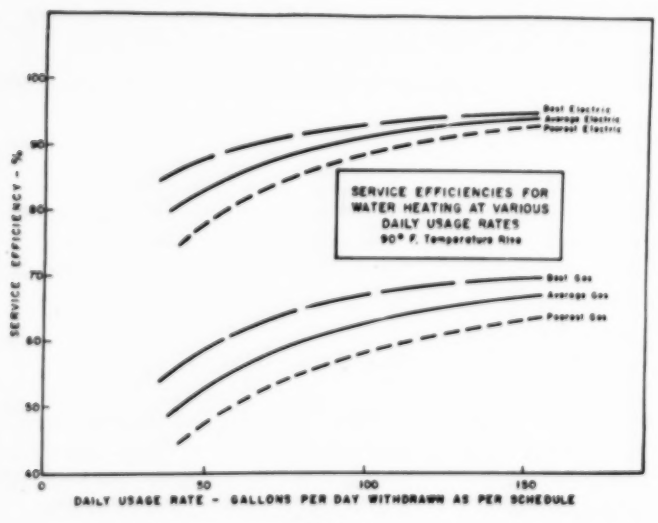

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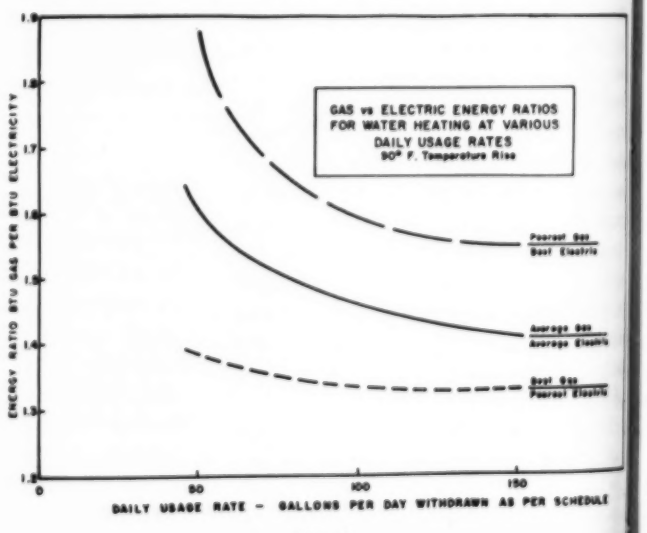
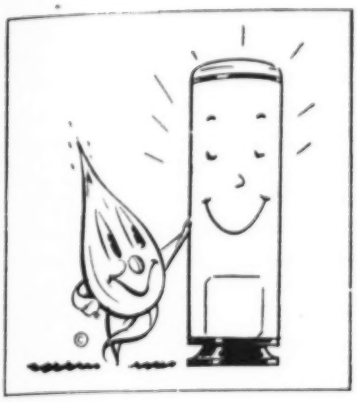


Fig. 4.

Lake Shore, Haverhill climb on water heater rental bandwagon



At two Ohio and Massachusetts utilities, enthusiastic customer reception of "hot-water-for-rent" plans is sparking revitalized merchandising programs — and helping them SELL a lot more water heaters as well.

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The plan of Lake Shore Gas Co., Ashtabula, Ohio, is actually only one phase in a revitalized merchandising program that is fast pulling the small Ohio company out of a flat-on-its-back situation. But the impact of this single activity is shown by the immediate acceptance of the public: within the first two weeks after the plan was announced, more than 300 units had been placed. For a utility serving some 11,700 residential gas meters, the added load was a respectable one—and, at last reports, it's continuing to grow.

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The program did it. For the six-week period from May 1, when the program began, through June 12, a total of 644 rental gas water heaters had been placed. Sales, too, perked up, totaling 194 in the same period, only slightly less than the entire five-month total; and adding in 31 sales of electric models to the May-June period, total sales were ahead of the previous five months.

Grand totals of units placed, both gas rental and gas and electric sales, are even more impressive. Eight hundred sixty-nine units, all told, went on the line in the six weeks; and for the entire six-plus months, 1086 heaters were placed. This was double the 1953 record, which up until May 1 would have appeared to be unattainable.

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The obvious solution was to install the heaters free of charge and levy a nominal rental charge on the tenant each month—$2 per 30-gal. water heater, under the Blackstone plan. Here, in essence, is the way the plan works, in the words of Mr. Pemberton:

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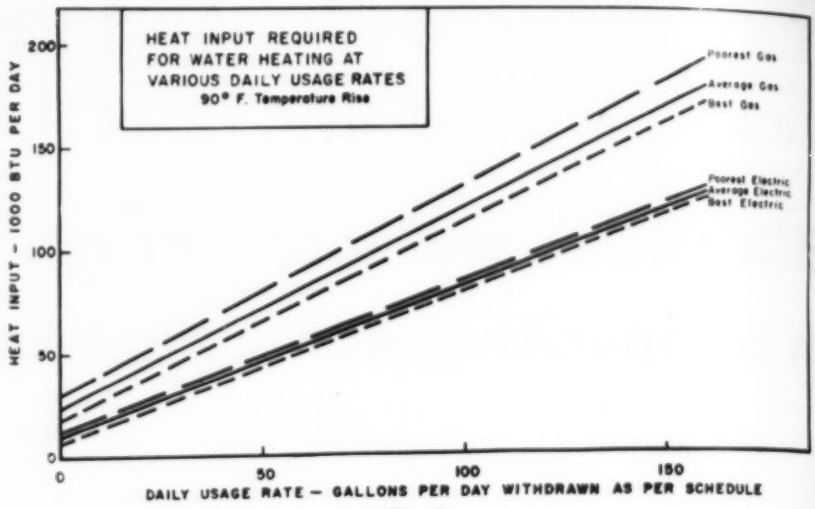

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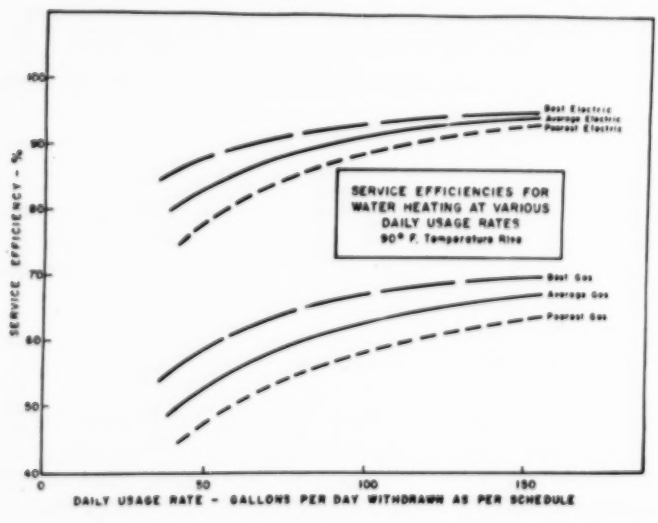

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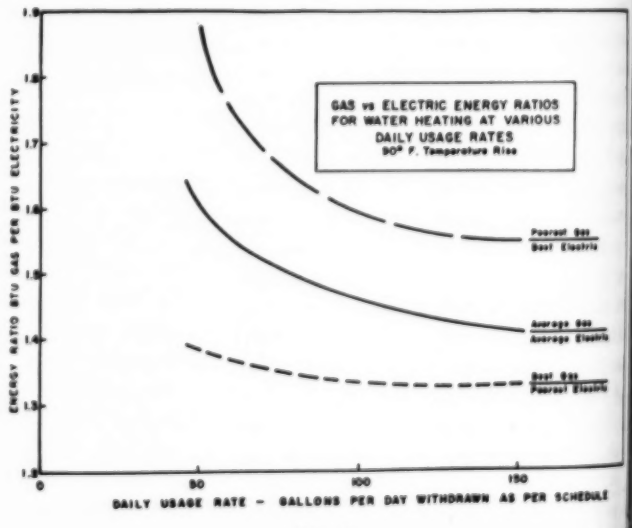

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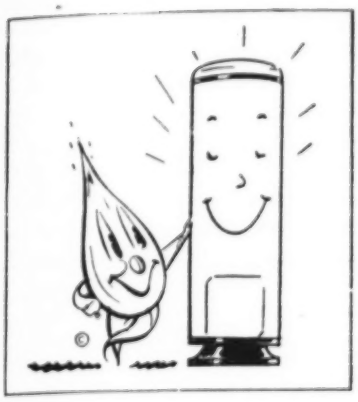

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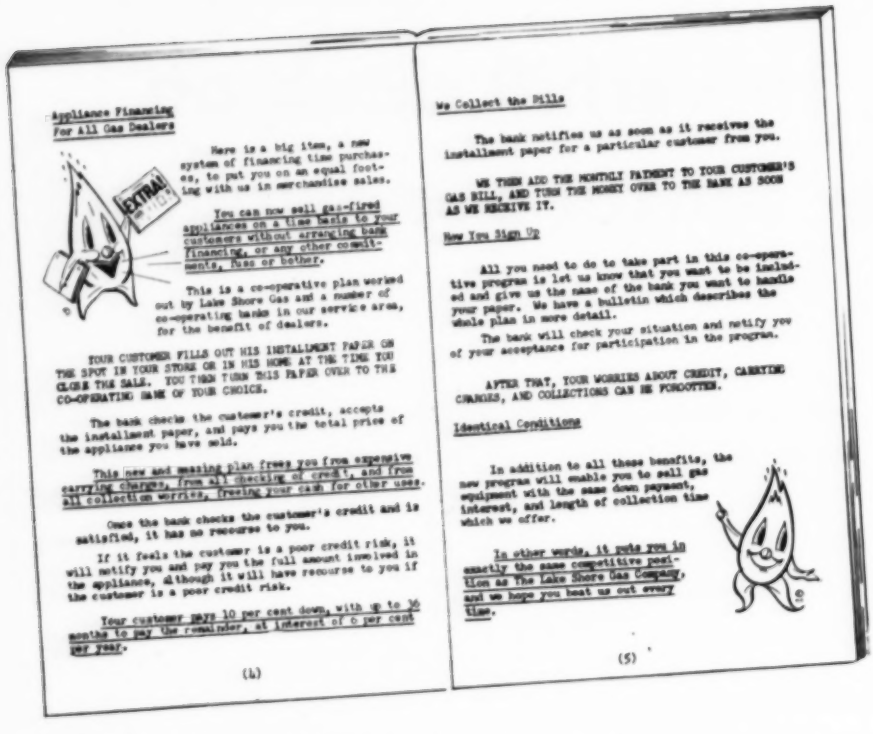


Appliance Financing
For All Gas Dealers

Here is a big item, a new system of financing time purchases, to put you on an equal footing with us in merchandise sales.

You can now sell gas-fired appliances on a time basis to your customers without arranging bank financing, or any other commitments, fuss or bother.

This is a co-operative plan worked out by Lake Shore Gas and a number of co-operating banks in our service area, for the benefit of dealers.

YOUR CUSTOMER FILLS OUT HIS INSTALLMENT PAPER ON THE SPOT IN YOUR STORE OR IN HIS HOME AT THE TIME YOU CLOSE THE SALE. YOU THEN TURN THIS PAPER OVER TO THE CO-OPERATING BANK OF YOUR CHOICE.

The bank checks the customer's credit, accepts the installment paper, and pays you the total price of the appliance you have sold.

This new and amazing plan frees you from expensive carrying charges, from all checking of credit, and from all collection worries, freeing your cash for other uses.

Once the bank checks the customer's credit and is satisfied, it has no recourse to you.

If it feels the customer is a poor credit risk, it will notify you and pay you the full amount involved in the appliance, although it will have recourse to you if the customer is a poor credit risk.

Your customer pays 10 per cent down, with up to 36 months to pay the remainder, at interest of 6 per cent per year.

(4)

We Collect the Bills

The bank notifies us as soon as it receives the installment paper for a particular customer from you.

WE THEN ADD THE MONTHLY PAYMENT TO YOUR CUSTOMER'S GAS BILL, AND TURN THE MONEY OVER TO THE BANK AS SOON AS WE RECEIVE IT.

How You Sign Up

All you need to do to take part in this co-operative program is let us know that you want to be included and give us the name of the bank you want to handle your paper. We have a bulletin which describes the whole plan in more detail.

The bank will check your situation and notify you of your acceptance for participation in the program.

AFTER THAT, YOUR WORRIES ABOUT CREDIT, CARRYING CHARGES, AND COLLECTIONS CAN BE FORGOTTEN.

Identical Conditions

In addition to all these benefits, the new program will enable you to sell gas equipment with the same down payment, interest, and length of collection time which we offer.

In other words, it puts you in exactly the same competitive position as The Lake Shore Gas Company, and we hope you beat us out every time.

(5)

Dealers' questions on appliance financing, along with others, were answered by Lake Shore in its booklet on the 1954 cooperative sales and advertising program.

are to be recovered through rental receipts.

"Water heaters removed from consumers' premises will be retired from plant. In such cases the unamortized balance of the cost of installations will be charged against current operations. Rental reserve, depreciation expense, amortization of installation costs, and incidental labor and expenses in connection with water heater rentals will be reported as 'other utility operating income—miscellaneous rent income.' Commissions and advertising expenses will, of course, be charged to new business expenses.

"In 100 months we will have rental receipts of $200, at a rental of $2 monthly, for each heater which stays in service for that period. By this time the heater will be completely depreciated and we will have recovered more than our entire expenses including investment in the heaters, installation costs, sales and promotion expenses, service and maintenance costs as well as interest on our investment.

"In the meantime we will be receiving substantially increased revenues from gas sold to operate these heaters. On the basis of 1000 water heaters, which we hope to rent in the next 12 months, over and above our normal sales of 1000 heaters, our total costs in connection with this additional rental business for all expenses as mentioned above should be in the neighborhood of $190,000. As this money is being invested, however, we will be receiving income from rental payments and also from increased gas revenues so that at the end of a full year for each installation we will, for 1000 heaters, have recovered $24,000, from rental payments plus an estimated $35,000 in annual gross revenues. A good portion of this gross will naturally find its way down into net revenue and within a relatively short time we should be realizing a good profit from this rental activity.

"After the program has been underway for awhile, we undoubtedly will have an opportunity to convert many of these heaters to a sale basis. We have not as yet determined exactly how the selling price will be arrived at but a good portion, if not all, of the rental payments will be credited towards the purchase price."

Lake Shore's rental plan is only one segment of an extremely comprehensive merchandising policy that is stressing a mighty dealer cooperation effort. Lake Shore frankly admits it wasn't practicing the preachments of the Gas Industry Development Program—so when GID was devised, Lake Shore had cobwebs of prejudice to sweep away; it simply adopted the GID tenets lock, stock, and barrel—with some twists of its own to boot.

Fred K. Lehtinen, sales manager for Lake Shore, spins a woeful tale of conditions facing the company last year. Says he:

"The adage, 'Necessity is the mother of invention,' fits our present program completely. Our history from 1941 to 1953 indicates a very trying period when we faced situations beyond our ability to overcome. We had a questionable supply of artificial gas which failed us on several occasions. Restrictions, both self-imposed and regulatory, lost the new home market to us as we could not take on new customers. Rising costs in almost every phase of our operation cut seriously into our earnings, wherein it was necessary to eliminate promotional funds. Lack of earnings and a short gas supply threatened our existence as a going concern. We increased our rates only slightly because all through this period and even now, we were faced with electric competition that we believe to be as tough as any in the nation. Our electric competition enjoyed an opposite situation throughout our trying years. With earnings and sales constantly on the gain, they naturally hit us with everything in the book. We lost the new home market to them, several thousand existing customers and, most serious of all, public acceptance. This 12-year period ended with the advent of natural gas, which was made available by a tie-in with one of the transcontinental lines.

"We then had a good supply of gas in sufficient quantity to re-evaluate our position and plot a new course of activity. We knew that natural gas in itself was not a total solution to our problem. Realizing this, we analyzed every phase of our business so that we might recapture our position in the shortest time possible.

"In my opinion, one of the most important decisions made was to arrive at a rate structure that would permit adequate funds for aggressive sales promotions and improvements in our physical structure such as revamping our distribution system, remodeling our offices and plant, purchasing new automobiles, trucks, tools, etc.

"After nearly one year of operation with natural gas we felt that we had achieved sales goals that were noteworthy in the space heating and industrial fields. We made great strides in

improving our properties and will continue this work as long as necessary.

"Late in 1953, we held a series of discussions regarding our 1954 plan of procedure. We concluded these meetings by adopting the Gas Industry Development program almost to the letter. We added salesmen to our staff wherein each salesman now has 1850 customers in a protected territory which he can develop through company guidance and self-enterprise. We established a gas development department to work with contractors, architects and realtors in the new home field. We concentrate on public relations in every way possible, especially by releasing informative press copy of our progress along with quarterly reports to municipalities. We give these reports wide distribution by direct mail.

"Two of the most potent aspects of our 1954 sales promotion are the gas water heater rental program and the new dealer relations plan. Both were devised after a great deal of study and investigation.

"Our rental plan is similar to those now in operation in other companies, except for the fact that we have enlisted all the gas appliance dealers in our area to participate in its benefits."

Like Blackstone and others, Lake Shore selected a top-grade rather than a competitive model—the Rex XL. For the 30-gal. size, the rental charge is $1.75; for the 40-gal., $2. The smaller capacity regularly retails for $144.50.

Installation and servicing are free to the user. Rental charges are added to the monthly bills.

Lake Shore's dealers are full partners in the venture as well as in many other facets of the overall company merchandising program. Dealers may rent the heaters themselves; Lake Shore pays $15 for every one rented, and another $25 to cover cost of installation on those where dealers wish to do the job themselves. The utility handles the merchandise in its own warehouses, so dealers are not obliged to carry an inventory; those who choose not to install simply notify the utility, and it does the rest—including issuing the $15 check ($17.50 for a 40-gal. model), while those who do the installing pick up the heaters from the utility warehouse.

Lake Shore also pays "the regular 40%" of the net cost of all the dealer's

A big portion of Lake Shore's efforts go into cooperative advertising (right) in which the company pays 40% of costs.

A look at the facts about our new program to rent water heaters at 5½ cents a day.

Enjoying all the benefits of a top quality, fully automatic gas water heater at a rental of only 5½ cents a day or $1.75 a month seems almost too good to believe.

However, this program sponsored by The Lake Shore Gas Company is now a fact. The same gas water heater that would have been available yesterday only at an outlay of $144.50 is yours today for a rental of just 5½ cents a day, added to your monthly gas bill.

You owe it to yourself to consider this offer personally. It can provide all the hot water you need three times faster and up to three times cheaper. There are no extras. The low rental covers normal installation and venting, everything.

FIRST OF ITS KIND

The reason we at Lake Shore Gas can offer such a plan through recognized dealers and through our own organization is that natural gas is proving so popular here, which gives us the confidence to buy heaters in carload lots. This means that we buy at a low price, and can pass along the savings to you through the low-cost rental plan, financed for us by bankers who share our confidence in natural gas.

It is important to remember that satisfaction is guaranteed under our plan. You pay no initial cost and are under no obligation. You can ask us to remove the heater at any time. Or if you someday want to buy it, we will be glad to apply a major part of your rental to the purchase price.

A TOP QUALITY HEATER

In selecting a rental heater, we made a careful study — not to find an inexpensive unit, but to determine which of the various heaters in use here appeared to be the very finest one we could offer. The famous Rex "XL" Heater was selected as a result. You simply could not buy a better heater anywhere than the one we are willing to rent you for 5½ cents a day.

Operation of the Rex "XL" is completely automatic, dependable, and carefree. You can adjust it for any temperature you desire. Every modern device for convenience and safety is built into this heater —including a safety pilot, draft diverter, temperature and pressure relief valve, extra heavy insulation, rigid construction, and beautiful enamel finish.

LESS TO OPERATE

Of course, the big saving to you under this program is in making it easy for you to heat your water with the most economical of all fuels for this purpose. Few people realize how much less it costs to heat water with natural gas. Under certain conditions, natural gas may cost only one-third as much as the only other fully automatic fuel for heating water.

And it is a scientific fact that modern gas automatic water heaters heat three times as many gallons of water in an hour as any other all-automatic system.

A 30-gallon Rex will probably provide you with all the hot water you need when you need it, and this rents for only $1.75 a month under our new program. A large family with several bathrooms may need a 40-gallon REX, but even this rents for only $2 a month.

NO FUSS OR RED TAPE

Whether you're heating your water with a high-cost fuel, or whether you are heating with natural gas but using an old-style, non-automatic unit, you'll enjoy greater comfort, greater convenience, and substantial savings under our new rental program.

We naturally have taken all possible steps to obtain a large supply of automatic REX heaters to meet the demand for rental units. However, there is a limit to the number of men available for installation work. We also can make our offer only to customers on or near our lines.

For these reasons, we urge that you get in touch with a dealer quickly to find out if you qualify for this program and to reserve your heater if you do. You can rent a Rex "XL" Heater under our program through any of the following dealers —

Or you can call our nearest office for any additional information you may desire. This plan has been tailored for you. We hope you'll try it now, today, because we're sure you'll like it if you do.

Rent Your Hot Water Heater From The Following Dealers Or The Lake Shore Gas Company

ASHTABULA

Ashtabula Bar & Restaurant Suppl...
...2nd St. Pho...

Phil...
3215 Lake Ave...

J. E. McGranahan Heating
1543 W. 8th St. Phone 49-370

Ted R. Mills Plumbing & Heating
4118 Main Ave. Phone 26-618

Mitchell Hardware Co.
4712 Main Ave. Phone 26-441

North End Appliance & Television
...ke Ave. Phone 49-781

Hardwa...

...201 St...

Maytag Sales & Service
462 State St. Phone 62-031

Sanger Electric Company
256 Main St. Phone 51-801

Smile Plumbing & Heating
231 High St. Phone 31-931

Clyde Smith
567 Liberty St. Phone 62-611

West End Hardware
740 Main St. Phone 32-344

GENEVA

...G Plumbing Company
...wan St. P... ...061

...tram...

...hone

NORTH KINGSVILLE

Doan Upholstering & Appliance Co.
Rt. 20 Phone 4-1951

PERRY

Stiles Plumbing & Heating
Main St. Phone 3131

The LAKE SHORE Gas Company

Bringing You NATURAL GAS... Nature's Miracle for BETTER LIVING

Customer service dispatching office of Hartford Gas. Operator at right receives phone calls from customers; operator at left gives orders to servicemen via radio. RCA Carfone mobile radio is on the desk in the foreground.

Hartford Gas saves money, improves service with radio equipment

THREE years' experience with radio communication equipment has proved to Hartford (Conn.) Gas Co. the wisdom of the decision made in June 1951 to install one base station and 20 mobile "Carfones."

According to Purchasing Agent Robert Turner, radio was sold to company management on the basis of expediting the operations of the service division. "We have more than paid for the installation in savings of time and service rendered. In addition, it's available for Civil Defense programs, in which all our men participate."

Two remote controls are connected to the 60-watt Carfone station transmitter, which is located in the compressor room at the base of a gas holder. Underground control cable connects station with control units. One remote control is at the main dispatch and service headquarters, the other at the plan and street office. An area of 100 square miles is covered by the communication system.

Ten service trucks, seven supervisors' cars, and three street department trucks are equipped with 15-watt Carfones, which are powered by the auto battery. Mobile transmitters and receivers are mounted under the seat of the truck or in the trunk of the car; controls, microphone, and speaker are on the dash.

When requests to turn on or off, to adjust equipment, or to investigate are received at the downtown office, they are relayed to the service dispatcher by teletype. In turn, the messages are dispatched by servicemen by radio from service headquarters.

A location sheet in the possession of the dispatcher and supervisor shows where crews are at all times. Emergency repairs can be done in half the time since installation of the radio equipment, according to Tom Riddell, general foreman of the street division. "When signal 27 comes in, we dispatch the man nearest our plant to pick up material and then we all converge at the leak."

Signal 27 (underground gas leak) is just one of a series of signal numbers that serve for messages frequently used. A card containing all code signals is placed in each car and truck directly above the windshield. Radio transmissions from fixed stations are identified by "service" or "street" to indicate point of origin.

Radio creates much good will among customers because of fast results. Speed in answering fire and other emergency calls results in protection of public property and saving of life. When a severe leak is reported, several cars are dispatched so that in the event traffic conditions are slowing travel in certain areas, at least one car will arrive in time.

The advantages of speedy service were shown at a recent three-alarm fire when the company got three service crews and the street department there so fast that although the service box couldn't be reached the crew had sufficient time to dig in order to shut off the gas.

The RCA radio system, which operates seven days a week and provides 24-hour, round-the-clock service, was installed and is kept in condition by the RCA Service Co.

supporting advertising for the program.

As a matter of interest in this connection, here is a brief resume of the utility's other dealer helps:

1. Arranges appliance financing for all dealers. Lake Shore has worked out an agreement with several banks to handle the paper without recourse (except for purchasers with questionable credit ratings). The utility adds the payments to its regular bills, so the dealer has no further collection worries. A 10%-down-payment-36-months-to-pay plan is provided.

2. Provides a comprehensive advertising program, utilizing varied media,

to support the dealers' efforts, and ties in with all AGA advertising and promotions.

3. Pays bonuses to dealer salesmen ranging up to $20 for "matchless" ranges.

4. Pays 40% of cooperative advertising costs.

5. Makes free range, dryer, or refrigerator installations in the home of any dealer or dealer salesman.

6. Makes free installations, including pipe, fittings, connectors, and valves, for dealer floor displays.

7. Makes free demonstrations on the dealer's floor.

8. Furnishes free sales helps—window displays, literature, etc.

9. Provides home service followup after dealers' sales.

10. Gives free adjustment of appliances.

11. Furnishes free sales movies.

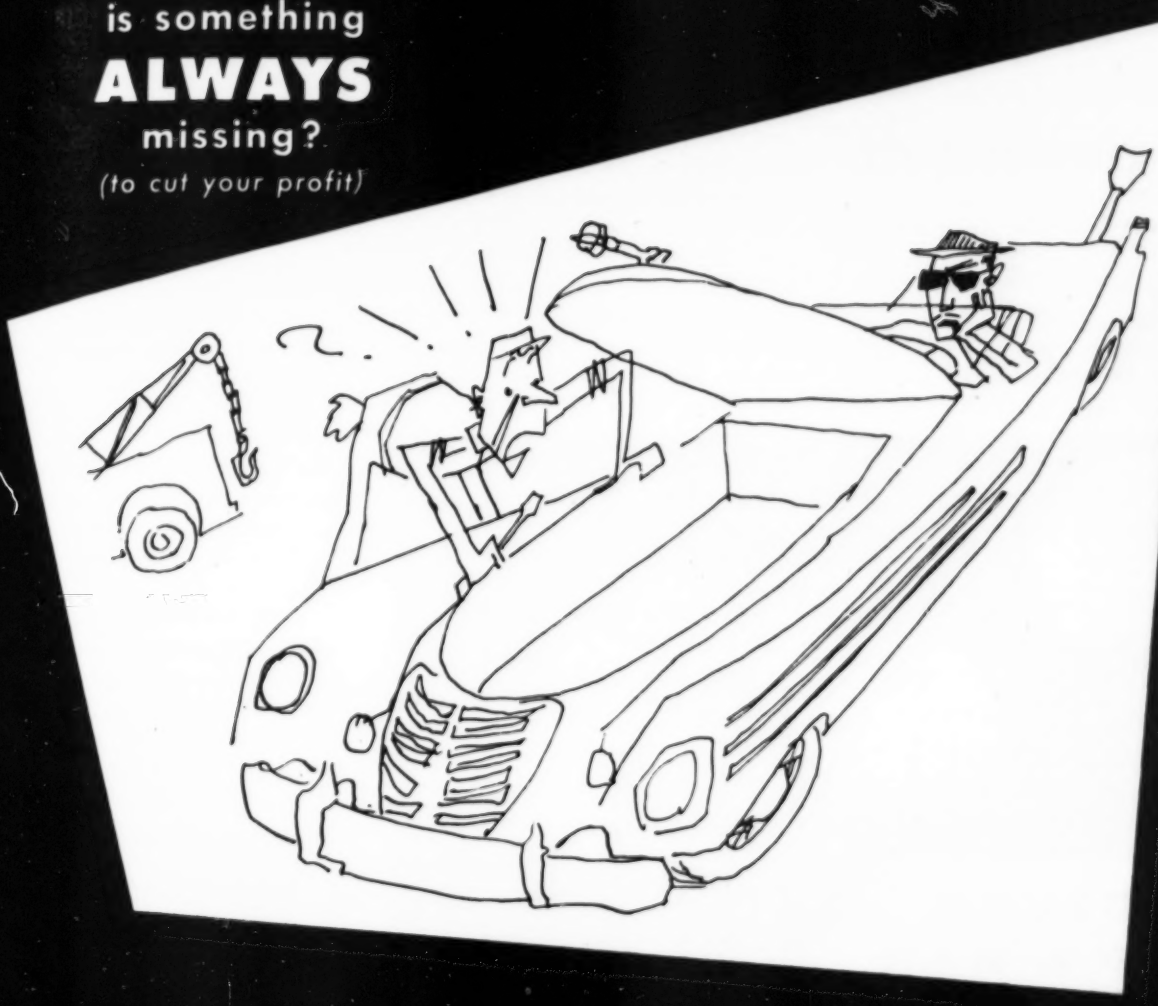
12. Offers unlimited sales training for dealer personnel.

13. Helps dealers obtain new franchises.

14. Installs and services gas appliances, when requested, at nominal cost.

A complete and detailed recounting of the many parts of the big Lake Shore program is beyond the scope of this article. For further information on the company's present policy, see the American Gas Association *Monthly* for April 1954.

is something
ALWAYS
missing?
(to cut your profit)



...then switch to the one line that meets every selling need

* **EXAMPLE No. 6:** It's easy to improve your profit performance with an aggressive line-up of factory experts behind you. Bryant's field representation puts the services of *all* these men at your disposal: a division sales manager; a district sales representative; and a traveling, three-man, sales-training and service team consisting of a heating product specialist; an air conditioning specialist, and a merchandising specialist. You can avail yourself of *all* these profit-building services by switching to Bryant, *now!*

Your Bryant Distributor has full details.

bryant®

HEATING | AIR CONDITIONING | WATER HEATING

1. The most complete line in the industry
2. Quality products—Competitively priced
3. Established name—Good customer acceptance
4. Broad, attractive profit margins
5. Local Distributor warehousing and service
* 6. Factory district representatives and traveling sales training and service teams

Bryant Heater Div., Affiliated Gas Equipment, Inc., 17825 St. Clair Ave., Cleveland 10, Ohio

Thermally Thinking

Continued from page 31

(S. 3178) were "indefinitely postponed" in early July, and this bill died on the vine before adjournment. It would have amended Section 6 (a) of the Natural Gas Act to require FPC to employ actual, original cost in valuing company-owned gas reserves.

Senator Ferguson requested postponement of the hearings on his own measure, declaring that it would need "considerably more study in the light of the (Phillips) decision." His motion was approved by James H. Lee, assistant corporation counsel for the City of Detroit, who was to appear before the Senate committee to testify in his official capacity and as a representative of the National Institute of Municipal Law Officers. Mr. Lee took the position that the Ferguson Bill was proper and timely when introduced, but that the Phillips decision had changed the situation.

FPC stand on exemption rule

The Federal Power Commission went right ahead with adoption of its proposed rule change for carrying out the Hinshaw amendment to the Natural Gas Act, in spite of the contrary views of the Federal Power Commission Bar Association and the National Association of Railroad & Utilities Commissioners, who had stated that the new law was self-executing.

The FPC's new rule, effective July 7, requires intrastate gas distributors seeking exemption under the Hinshaw amendment to file applications showing that they do not sell gas for resale and are subject to state commission regulation, etc.

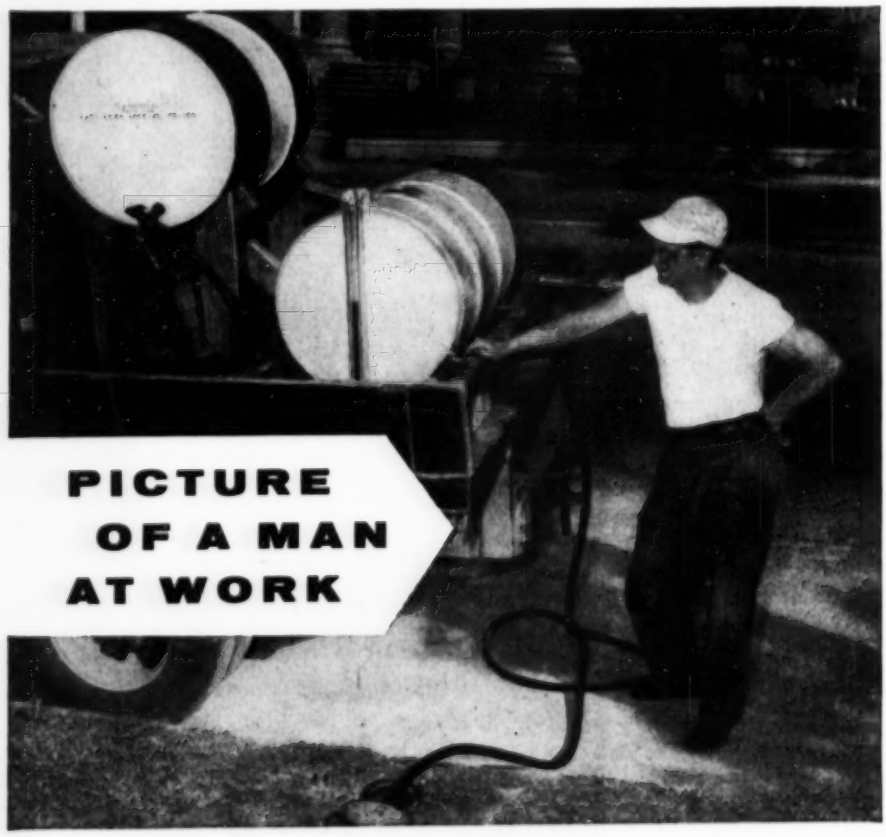
Both the NARUC and the FPC Bar Association took the view that the proposed rule was unnecessary under the amendment and that such exemption should be automatic, which thus would obviate the necessity of reports to the FPC.

No imports, is FPC stand

The key phrase in the Federal Power Commission's decision to authorize Pacific Northwest Pipeline Corp. to transport natural gas to Pacific Northwest markets from the San Juan basin in New Mexico, is this one:

". . . all control over the production, allocation, and transportation to our border . . . would be in the hands of agencies of foreign governments, whose primary interest would of necessity always be in the needs and advantages of their own people, and whose judgments and actions would be essentially dependent upon public opinion within that country, rather than upon the interests of American consumers . . ."

While Chairman Jerome J. Kuykendall dissented in part from this reasoning, it seems evident that this will be a guiding consideration of the FPC for some years to come. This means that the possibilities of any part of the U. S. being serviced from foreign fields—either Canadian or Mexican—are rather remote at this time. As we have pointed out here before, it is particularly difficult, except in local situations, for people to do business across national borders, because the politicians of each country constantly must think of themselves, and take into account nationalistic tendencies of their own people.



WHAT'S HE DOING? Applying CARBOSEAL anti-leak to a gas main—to stop leakage due to dried-out fiber packing.

This man works for a wide-awake gas company that knows CARBOSEAL anti-leak is:

- ***effective***
- ***lasting***
- ***inexpensive***
- ***easy and economical to apply***

Get all the facts. Write for the booklet, Form 4506—or the 16mm. color-sound movie, "CARBOSEAL Anti-Leak Stops Gas-Main Leakage," which will be sent to you without charge—on request.

CARBOSEAL ANTI-LEAK

Carbide and Carbon Chemicals Company
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
In Canada:
Carbide and Carbon Chemicals, Limited, Toronto

"Carboseal" is a registered trade-mark of Union Carbide and Carbon Corporation.

DISTRIBUTORS

(each one an expert on trapping those Reluctant Bucks!)

Alabama Birmingham
Auto Service Company

California Los Angeles
United Western Distributors, Inc.
San Francisco
J. J. Lukanish Company

Colorado Denver
The Parker Company

Connecticut Hartford
Emerson Radio of Connecticut

Florida Miami
Maloney Distributing Company

Illinois Chicago
Remco, Inc.
Peoria
Griffin Distributing Company

Indiana Fort Wayne
Femco Corporation
Indianapolis
Sanborn Electric Company
South Bend
Femco, Incorporated

Iowa Davenport
Tri-City Radio Supply
Des Moines
G. W. Onthank Company

Kansas Wichita
Central States Distributors, Inc.

Kentucky Louisville
Foster Distributing Co., Inc.

Louisiana New Orleans
Lighting Fixture and Electric Supply Co.

Massachusetts Allston
Vaughn Electrical Company, Inc.
Springfield
Driscoll-Weber, Inc.

Michigan Detroit
Peninsular Distributing Company
Grand Rapids
Republic Distributors
Saginaw
Northern Supply Company

Minnesota Minneapolis
Forster Distributing Company

Missouri Kansas City
Central States Distributors, Inc.
St. Louis
Central States Distributors, Inc.

Montana Billings
Northwestern Auto Supply Company

Nebraska Omaha
Maloney Distributing Company

New Jersey Newark
Igoe Brothers

New York Binghamton
Broome Dist. Company
Brooklyn
Charles Tisch, Inc.
Buffalo
Foysan Distributors, Inc.
Rochester
Beaucaire, Inc.
Syracuse
Broome Distributing Company
Troy
Empire State Wholesalers, Inc.

North Carolina Raleigh
Nash-Steele-Warren, Inc.

North Dakota Fargo
Fargo Glass and Paint Company

Ohio Cincinnati
Johnson Electric Supply Company
Cleveland
Tecca Distributing Company
Columbus
Luethi and Welch, Inc.
Dayton
V. J. McGranahan, Inc.
Toledo
McGranahan Dist. Company

Oregon Portland
R. M. Wade and Company

Pennsylvania Philadelphia
Stuart F. Louchheim Company
Pittsburgh
J. A. Williams Company
Wilkes-Barre
R. B. Wall Company

South Dakota Sioux Falls
L. C. Lippert Company

Tennessee Memphis
Woodson & Bozeman, Inc.

Texas Amarillo
Price Supply Company
El Paso (includes Albuquerque, New Mexico Territory)
The Irion Company, Inc.
Houston
Perkins Distributing Company
San Antonio
Standard Distributing Company

Utah Salt Lake City
Deseret Appliance Dist., Inc.

Virginia Norfolk
Davis Distributing Company

Washington Seattle
R. M. Wade and Company
Spokane
True's Distributing Company

Washington, D. C.
Southern Wholesalers

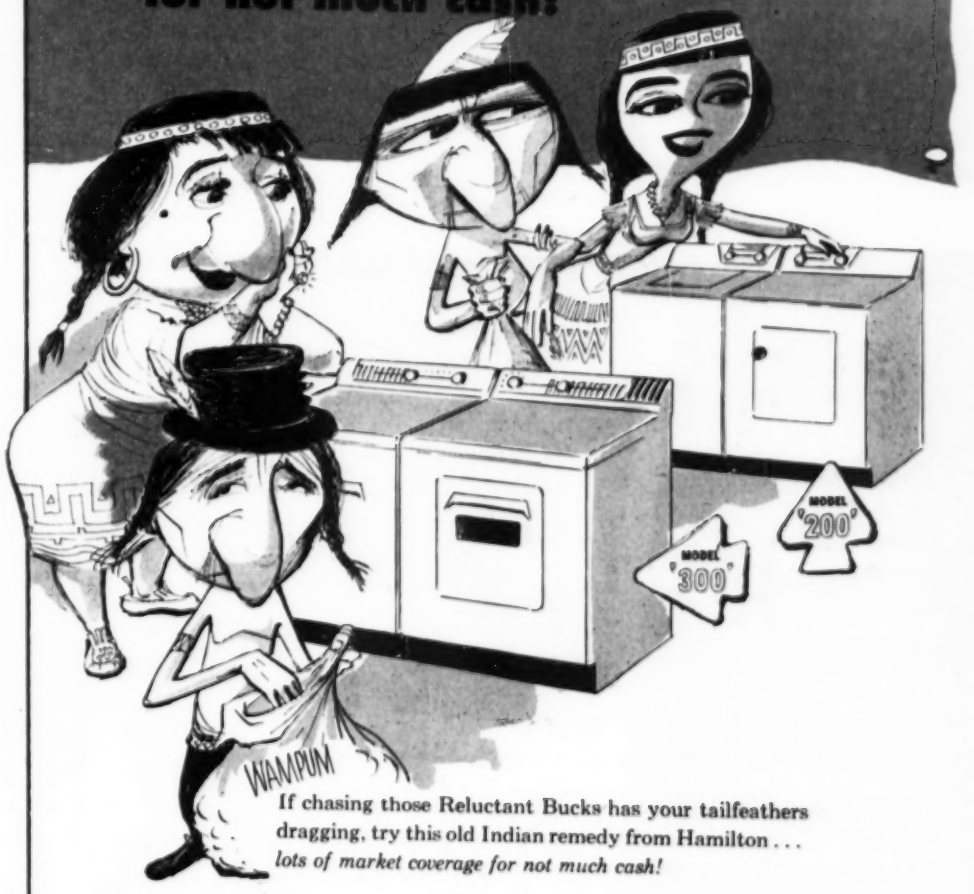
West Virginia Charleston
Pugh Furniture Company

Wisconsin Milwaukee
Taylor Electric Company

Hawaii Honolulu
Hawaiian Wholesale Factors

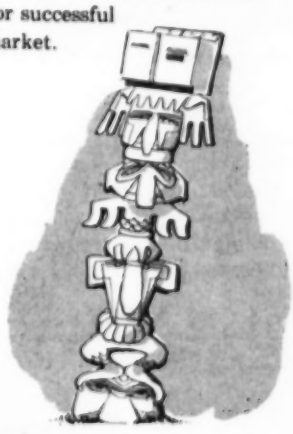
Ontario, Canada Hamilton
The Coffield Washer Company, Ltd.

in today's Reluctant Buck market Hamilton gives you lots of coverage for not much cash!



If chasing those Reluctant Bucks has your tailfeathers dragging, try this old Indian remedy from Hamilton . . . *lots of market coverage for not much cash!*

The story's so simple it can be told in just two numbers! The big, beautiful Hamilton '300', and the budget-priced Hamilton '200'—each with a choice of gas or electric dryers . . . each loaded with lots of "how-to-sell-'em" features! Yes, Hamilton has the right medicine for successful home laundry sales in today's Reluctant Buck market. Prove it? Glad to!



With many a redskin biting the dust —and more red faces than pale faces in view—Hamilton Home Laundry sales are running well ahead of our 1953 all-time-high!

If you like the sound of a short line that covers a b-i-g market, plan a profit pow-wow with your Hamilton Distributor soon!

Sell the name women know and trust

Hamilton

the folks who made automatic washdays possible

HAMILTON MANUFACTURING COMPANY • TWO RIVERS, WISCONSIN

rather than considering service solely on its merits.

Sales Pitches

That gnawing feeling

Are you ever troubled by a gnawing feeling that you're being nibbled away around the edges?

We don't mean ulcers. It's nothing physical, exactly. It's just the feeling that this gas business is being pecked at around the fringes by numerous covetous competitors who have found that you don't have to attack the heart if you can chop off the appendages, one by one.

We had just such a gnawing feeling the other night at dinner. But it had nothing to do with the food (delicious!) We were guests at the home of friends, and the lesson learned in "modern" ways to cook foods was a real eye-opener.

First off, there was the coffee pot. It was real purty—tall and gracefully slim, and it looked like it would hold a lot more than the eight cups credited to it. Sort of in line with the modern trend of making things not quite what they seem—taller, or bigger, or lower, or longer, but still somehow "functional" in styling. Closer inspection showed that part of the height was taken up by an electric element.

No, they're not exactly new, but they do seem to be growing in popularity. We understand they save labor. You still have to put in the grounds—and you measure them very carefully, or else. No fudging to save a little high-priced coffee. You still have to plug them in, which is a little more difficult than turning a gas valve—unless you've got a match-lit model. Have to wash them, too. But you don't have to *watch* them—when the coffee's done a little red light lights up and the coffee quits cooking—just stays on a "keep warm" heat. You can let the pot sit there, soaking up kw's and keeping the coffee at the right serving temperature all day long. Never gets any stronger, either.

The lady who owns it isn't quite sure how you'd adjust it if someone in the dinner party wanted his coffee stronger than the rest. She hasn't figured out how you'd set it. But she does all right with her pop-up toaster, so she may get the hang of it yet. It seems that the whole idea of the thing is to get away from flexibility. But who wants flexible coffee?

She was trying something else new, too—a waffle iron (electric) for "broiling" steaks. It's one of those combination waffle irons—makes hot cakes and also grills sandwiches—and the free-wheeling hinge permits the cook to slip some thick, juicy steaks between the covers. They tasted quite good—not like gas broiling or charcoal broiling, but good nonetheless.

She had a gas range, too, and it worked fine for heating up the peas and some other vegetables, I forget just what. It didn't work quite so fine, though, for broiling—after all, it's about 15 years old. We didn't inquire into how well it makes coffee.

On the service porch they had an electric roaster. It's one of those modern gadgets, with a red light, and I think some sort of timer. Anyway, even if it hasn't one, if you have a timer clock, you can hook it in and go out

This ad, printed here in black and white, is the full color, full page ad Caloric will run this fall.

Once more Caloric's out in front. This fall, full-color, full-page ads in leading consumer publications will pre-sell a selected market . . . an almost untapped market of folks who are buying homes or remodeling them. This campaign will make prospects for you. People will want to know more about these Caloric built-ins. Be sure you let them know you stock and sell these high-quality units. For complete information on how you can tie-in with this program, fill out the coupon below. Do it today!

HERE'S THE SCHEDULE

GOOD HOUSEKEEPING	October
SUNSET	October
HOME MODERNIZING	Fall edition
SMALL HOMES GUIDE	Winter edition

EXCLUSIVELY FOR GAS

CALORIC

CALORIC STOVE CORPORATION, TOPTON, PA.

Please send me at no obligation complete details on the Caloric built-in units and details on how I can tie in with Caloric's promotional program.

Name_____

Address_____

_____

Send coupon to Dept. G, Caloric Stove Corporation, Topton, Pa.

Puts the "Sell" in heater Selection

Model 2EC is a throttling-type heat control with adjustable bypass set at the time of installation to maintain a minimum flame over the main burner at all times. It assures a more even distribution of heat and continuous air circulation that helps overcome the "cold 70°". It is equipped with thermo-electric automatic pilot that automatically releases to provide 100% shutoff should pilot failure ever occur.

Here is a Control that offers you distinctive sales features incorporated in a unit known for its dependable performance. Here, too, is a Control made by *Robertshaw®*, a name known to millions because of a consistent national advertising program . . . and recognized by homeowners because of years of dependable service performed by millions of other *Robertshaw* controlled appliances everywhere in America.

Select the control that helps you sell—

Robertshaw-Fulton
CONTROLS COMPANY
ROBERTSHAW THERMOSTAT DIVISION
YOUNGWOOD, PENNSYLVANIA

shopping and your dinner's all roasted (that is, if you're having a roast) by the time you get home from the electric appliance store. Pretty slick. Something like the oven of a gas range.

It's a pretty nice setup, all around. The roaster cost maybe $50, and the toaster was around $25, and the waffle iron must have been about the same. Friend hubby got the coffee maker through a friend for $20, a saving of about $5. Real roughly, that's close to $100. The range cost about $87.50, 15 years ago. As I say, it warms beans and peas real fine.

Now they're shopping around for a "flameless" rotisserie, I understand.

Here's a home that's a real bulwark against the electric range. Heck, they don't need one.

We were sort of hoping that these folks were not exactly typical. But take it from the *Wall Street Journal*—apparently they are.

Said the reliable WSJ in a headline in its July issue:

"Are Stoves Done For? Makers of Electric Frying Pans Think So."

Read on:

"The old-fashioned, full-size kitchen range appears to be in for some hot competition from some up-and-coming small fry.

"That's the indication from the rash of new electric frying pans, table ovens, and other lightweight, portable cookery and food preparation equipment displayed here (Atlantic City) this past week at the National Housewares Manufacturers summer trade show..."

Here's another direct quote:

" 'Nobody will need a kitchen in another five years,' predicted a proponent of the lighter cooking equipment. Besides skillets, he had in mind electric sauce pans, casseroles, french fryers and roasters as items to displace the kitchen range.

"Popularity of the new equipment stems from its versatility, portability, ease, and economy of operation, and easy cleaning qualities, boosters say."

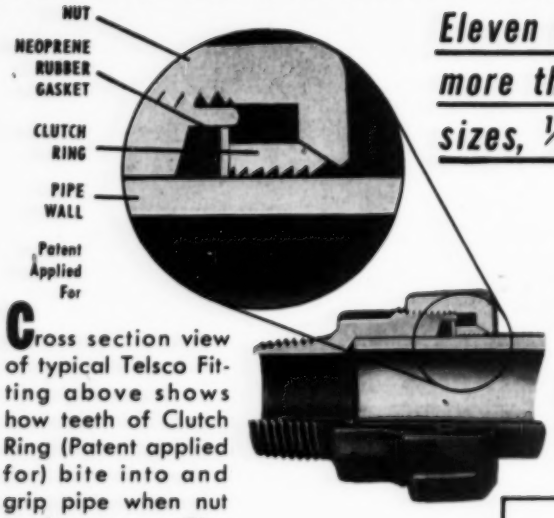
Hmmm? An electric frying pan is more versatile than a kitchen range? Easier to operate? Cheaper to operate? Easier to clean?

With due respect to the WSJ reporter, we'd like to offer a blue pencil; change that line to: "Popularity of the new equipment stems from *merchandising*—a type and quality of merchandising so powerful that it can change a whole way of life for the housewife, making her sneer at old-fashioned easy, quick, automatic, inexpensive cookery using an automatic gas range whose components are centralized in a single, compact, step-saving package of 'New Freedom,' and sending her scurrying in search of decentralized cooking units, inflexible table appliances, and expensive gadgetry of marvelous ingenuity."

What wizardry!

Telsco®

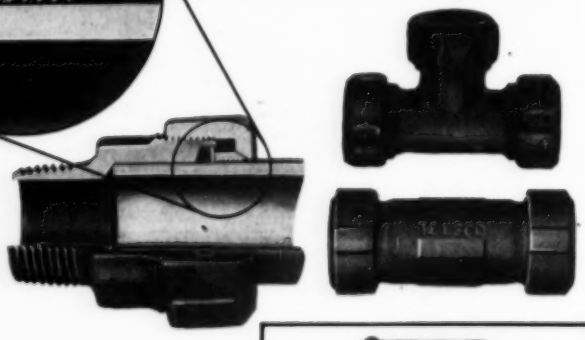
MALLEABLE IRON FITTINGS GET AND HOLD A BULLDOG GRIP ON STEEL AND PLASTIC PIPE



Cross section view of typical Telsco Fitting above shows how teeth of Clutch Ring (Patent applied for) bite into and grip pipe when nut is drawn up. The Neoprene Rubber Gasket, under pressure from the Clutch Ring on one end and the fitting body on the other, completely seals the connection against gas leaks.

Telsco Fittings are tested to hold at traction forces ranging from 1,450 to 3,600 lbs. They hold at hydrostatic forces ranging from 450 p.s.i. (on 2" pipe) to 8,250 p.s.i. (on ½" pipe)

Eleven different types, more than 100 different sizes, ½" through 2"



Metal Stiffeners

Telsco Brass Stiffeners to stop Thermoplastic "cold flow" are available to use with Telsco Fittings on Plastic Pipe. Stiffeners are split to allow for off-diameter pipe, and flared on one end to allow free flow through the connection.

Available in

Couplings (Long and Short), Adapters, 90° Elbows, Tees, Fitting Reducers and Fitting Increasers.

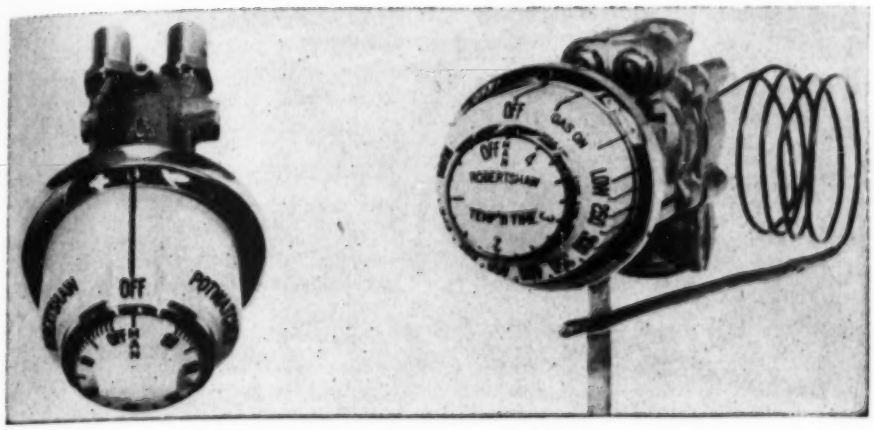
Literature

Complete information about Telsco Fittings: Ask for your copy of *Price List C*, just off the press.

TELSCO FITTINGS DIVISION
5423 REDFIELD STREET, DALLAS 19, TEXAS

New Products and Trade Literature

To secure further information on products or new literature, simply fill out the coupon and mail, indicating by number the information or literature needed.



1 Automatic Controls for Top Burners and Ovens

An automatic time control for top burners, the Potwatcher, and a time and temperature control for ovens, Temp 'n Time, have been announced by Robertshaw-Fulton Controls Co.

The distinctive feature of the controls is found in the unique timing mechanism, which operates with no greater energy source than the movement of an ordinary pocket watch. Enclosed within a small control knob, the entire timing mechanism is replaceable as a unit. A manual position on the control allows it to be used as a conventional hand-operated knob.

The Potwatcher is designed to turn the gas to the off position from any preset flame. It is equipped with a 60-minute timer. The valve is made of a brass forging. Operation of the timer is such that at the end of automatic cycle, the timer's set handle will be in off-center position with the indicator pointing to "off." In that position, no gas can flow through the gas cock. For manual operation, timer dial should be depressed and the indicator turned to "manual."

The timer is available with dual and single valves: dual valve has two fixed simmer positions—high and low. Single valve model has only a low simmer position, which is adjustable. Dual valve model has a hesitation stop when turned towards full "on," thereby insuring positive ignition. When dial is rotated towards the "off" position, low simmer hesitation is encountered. Setting on the low simmer position is obtained by use of fixed orifices. Body of valve contains small pressed-in orifice. Size of this orifice determines low simmer size.

Potwatcher gas cock valve can easily be taken apart for re-greasing or cleaning, as with any standard type valve. The timer mechanism is removable and interchangeable for service, if required. Bezel used in Potwatcher is the newest type, embodying the built-in spring.

The BJ Temp 'n Time is a combination of the company's standard and reliable BJ oven thermostat and a new timing mechanism. For the first time, it offers gas range manufacturers a semi-automatic oven eliminating the necessity of altering present range designs in any way.

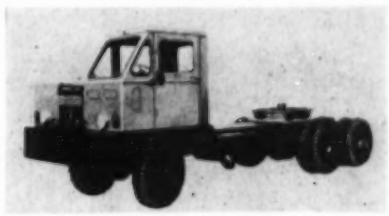
The BJ Temp 'n Time may be used as a standard BJ or, by use of the timing mechanism, made to shut off the oven at any predetermined time. The range is started manually but the shutoff is automatic.

Temp 'n Time has a timing mechanism of a four-hour type and uses exactly the same watch movements as the Potwatcher. Unit has the same advantage of replaceability for service and has the same rotation as the Potwatcher.

The Temp 'n Time has a dial rotation opposite to that of the standard BJ. This is done to avoid confusion on ranges equipped with both Potwatcher and Temp 'n Time.

Robertshaw-Fulton Controls Co.

■



2 Crane Carrier

A 6-by-6 crane carrier, completely remanufactured for mounting of the Model T-35 Schield Bantam power crane-shovel, has been announced by Schield Bantam Co.

Known as Model 200, the carrier has such new features as the GMC 6-cylinder engine, radiator, one-man cab, brake system, instruments, steering gears, plus reinforced main frame and completely rebuilt secondary assemblies.

The 200 will give owners a carrier with 40-mph road speeds, 2-speed transmission offering 10 forward speeds and two in reverse, and 6-wheel drive to provide extra

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GAS, 198 S. Alvarado St., Los Angeles 57, Calif.

8/54 Fill in numbers of items in which you are interested.

No. ..... No. ..... No. ..... No. .....

No. ..... No. ..... No. ..... No. .....

NAME AND TITLE .....

FIRM'S NAME .....

ADDRESS .....

CITY ..... ZONE ..... STATE .....

traction. Short turning radius of the rig enables operators to work with the rig in cramped quarters where space is at a premium.

Schield Bantam Co.

■

3 Built-in Range

Caloric Stove Corp. has gone into production on a new line of built-in gas cooking equipment.

Offering special flexibility in kitchen planning, the separate oven-broiler and top burner units can be placed at convenient heights anywhere in the kitchen. Door panels of the oven-broiler unit are available in the customer's choice of bright or satin metal finishes, or porcelain enamel in black, white, pastel blue, green or yellow. Detachable handles are provided in a wide range of colors.

Caloric Stove Corp.

■

4 Safety Probe

A new safety probe for testing for gas leaks has been announced by Frank's Machine Works.

The probe may be used with an explosameter by inserting the tube with the rubber hose attached to a compression box or chamber. Spark or coil condenser will cause a flash if there is a leak present. The probe can be operated by one man. It is operated by an impact force.

Frank's Machine Works

■

5 Pipe Cutter

Toledo Pipe Threading Machine Co. has introduced a new heavy duty pipe cutter that is designed to produce clean, smooth cut-offs with positive easy action. Of the wheel and roller type, the new cutter has a capacity of ⅛-in. to 2-in. pipe.

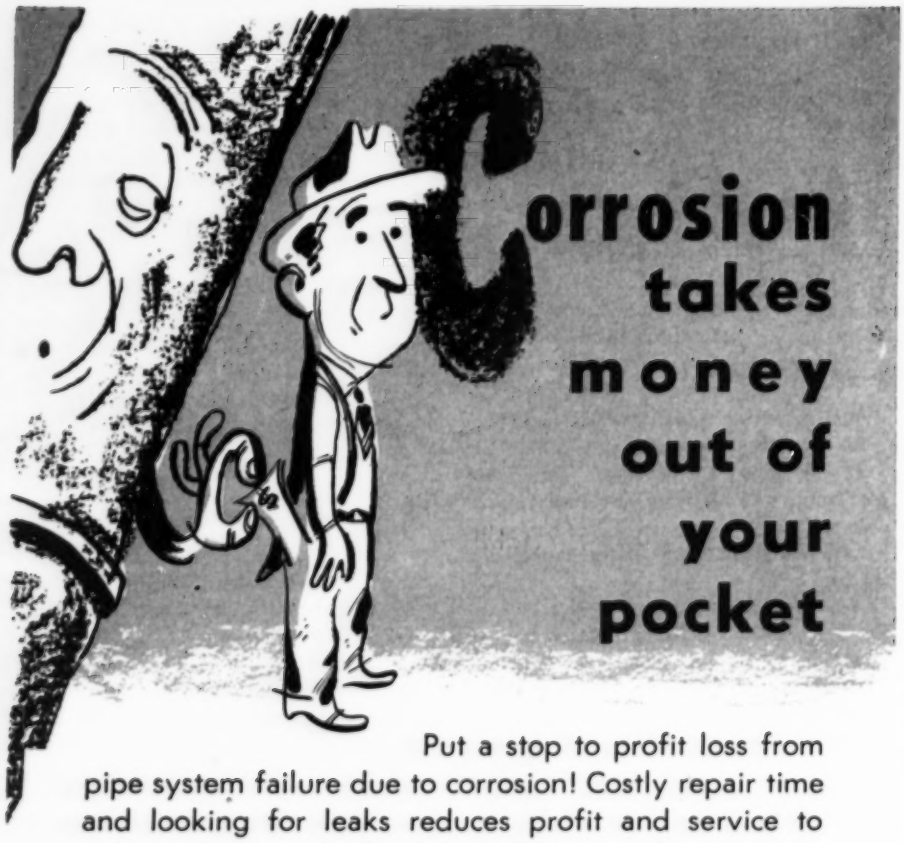
The cutter has high alloy steel cutter wheels. Rollers in hook provide a square base when starting tool on pipe. Single cutter wheel is in the sliding block.

Toledo Pipe Threading Machine Co.

■

6 Water Heater Control

Ultra modern appearance and simplicity of operation are featured in a new water heater control introduced by General Controls. The mechanism is contained in a compact aluminum case that fits against the water heater with a minimum of protrusion; all control functions are incorporated in the two satin-chrome dials. There are no levers



Put a stop to profit loss from pipe system failure due to corrosion! Costly repair time and looking for leaks reduces profit and service to your customers. **An-Spec magnesium anodes** can prolong the life of your underground metal pipe systems by years. The most modern way to combat profit stealing corrosion . . . is by installing **An-Spec magnesium anodes** . . . your quality anodes . . .

PIPE LINE ANODE CORPORATION

25th WEST AVENUE AND SAND SPRINGS ROAD

P. O. BOX 996 ● TULSA, OKLAHOMA

Pipeline Supply Company
2230 Magnolia Street
Birmingham Alabama

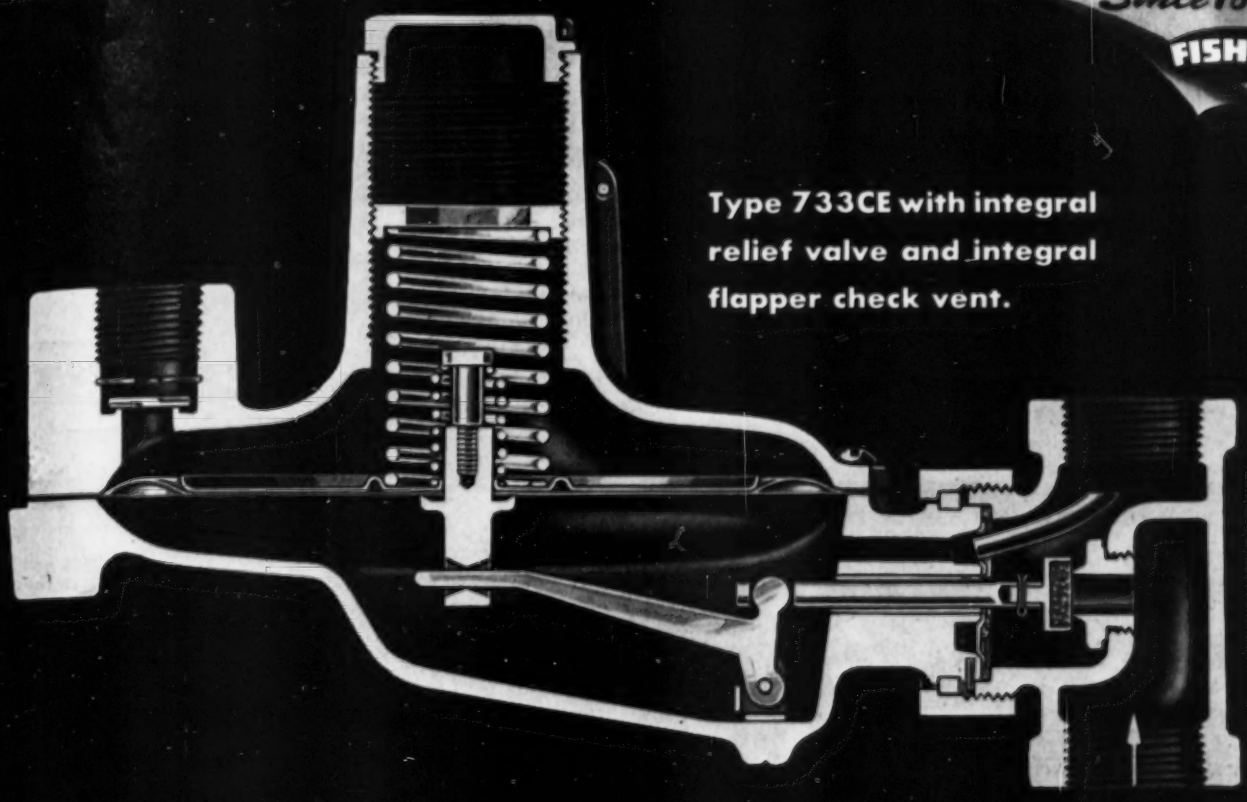
Crose Pipeline Equipment Co.
858 Wilson Avenue
Newark, New Jersey

Crose-Curran, Ltd.
11102 Jasper Avenue
Edmonton, Alberta

Pipeline Supply Company
912 West 11th
Houston, Texas

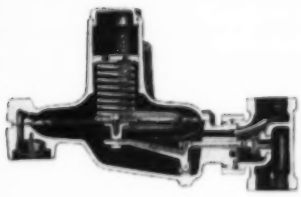
ANODE SPECIALISTS
AN·SPEC

Since 1880
FISHER



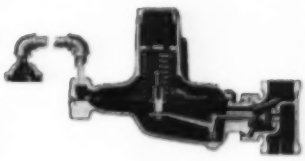
Type 733CE with integral relief valve and integral flapper check vent.

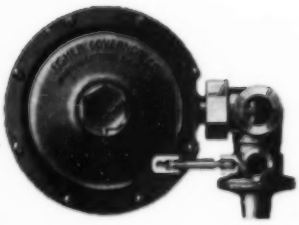
THERE'S A FISHER 730 FOR EVERY GAS SERVICE REGULATOR APPLICATION



● **TYPE 730CU Outdoor Service Regulator.** Weatherproof vent housing integral with lower casing for outdoor locations.

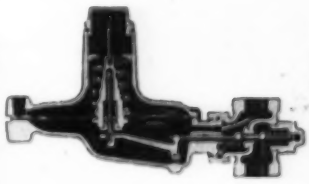
● **TYPE 733CT General Service Regulator** with Internal Relief Valve. Complete with weatherproof stabilizer vent for remote venting of indoor installations.





● **TYPE 732CN General Service Regulator** with Full Capacity Relief Valve on Body. Spring bonnet vented to ¾" outlet of full capacity relief valve to allow use of single regulator vent line on indoor installations.

● **TYPE 736CT* General Service Regulator** with Safety Shut-off Feature. Shuts off the flow of gas entirely either if the downstream pressure should exceed the regulator setting by a predetermined amount, or if there is a failure or near-failure of supply pressure.



* Also available as TYPE 737CT which shuts off flow of gas *only if downstream pressure is excessive.* Regulator remains operative on abnormally low inlet pressures.

COMPANY Marshalltown, Iowa

FOR BETTER GAS PRESSURE CONTROL

or buttons to manipulate in adjusting or relighting.

The upper dial in the G-7 incorporates on-an-off controls, plus simplified reset and relighting of the pilot; the lower dial provides for a complete range of temperature selections, with easy readability from a standing position.

General Controls Co.

■

7 Utility Truck Body

Morysville Body Works has added to its line a new heavy duty municipality body for water and gas line construction and maintenance work. Designed for chassis rated 2 to 2½ tons, this new service body has an overall length of 13½ ft, with a CA dimension of 108 in.

Interior features include deep lipped stowage shelves running across the front and along each side of the main compartment; double drum winch or air compressor; and a 4-man crew compartment.

Exterior features include two-section sliding roof, ladder hooks, hand grips, towing hook, threading machine, derrick poles and mounting brackets. In addition, there are 16 weathertight exterior compartments. For safety, all compartment doors have recessed, spring-loaded latches.

Morysville Body Works

■

Trade Literature

8 Coated Fabric Catalog

Haartz-Mason Inc. has added to its catalog listings of industrial coated fabric. Style No. 9038 is a Buna-N compound for high pressure regulator and valve material. The second listing is Style No. 9049, also a Buna-N compound.

Haartz-Mason Inc.

■

9 Honeywell Catalogs

Several catalogs are available from Minneapolis-Honeywell. (When ordering copies, use letter preceding description along with number of this notice.)

(a) Catalog No. 5001 is a revised composite catalog containing brief descriptions of all Brown Instruments together with comprehensive coverage of the products of Honeywell's Industrial Division.

(b) Catalog 2320 describes all types of flowmeters, including indicating, recording, integrating, and controlling instruments of both evenly graduated and square root types, as well as area meters and differential converters. Also included is a section on flow approximations and installation information.

Minneapolis-Honeywell Regulator Co.

■

10 Valve Pamphlet

A new publication entitled, "Your Handbook on Temperature and Pressure Relief Valves," has been released by A. W. Cash Valve Manufacturing Corp. This pamphlet explains and illustrates the function of relief valves, both temperature and pressure, insofar as water heaters—industrial and domestic—are concerned.

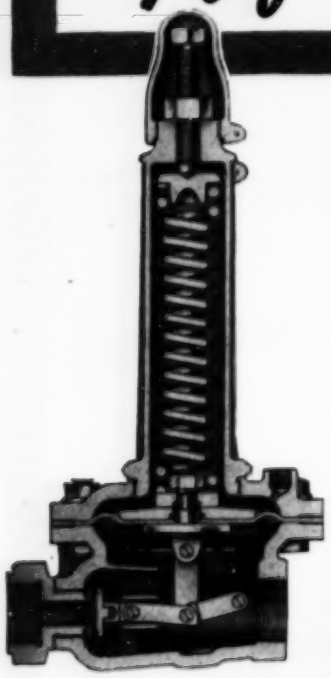
A. W. Cash Valve Manufacturing Corp.

■

11 Safety Equipment Booklet

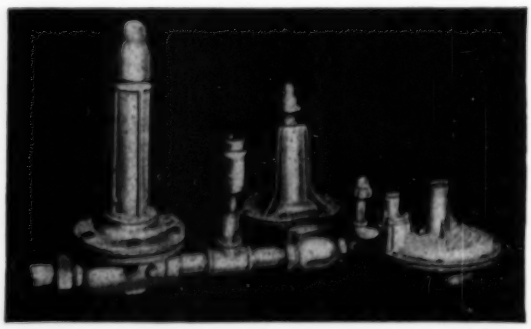
Acme Protection Equipment Co. has just published an illustrated booklet on canister-type gas masks, covering such subjects as canister construction, methods of determining gas concentrations, heating and humidity, deficiency of oxygen, and data on equipment for specific hazards in fire-fighting in the industrial, agricultural, and chemical fields. The four-page booklet also includes

IN THE HIGH PRESSURE FIELD
THERE IS SAFETY
IN Reynolds...



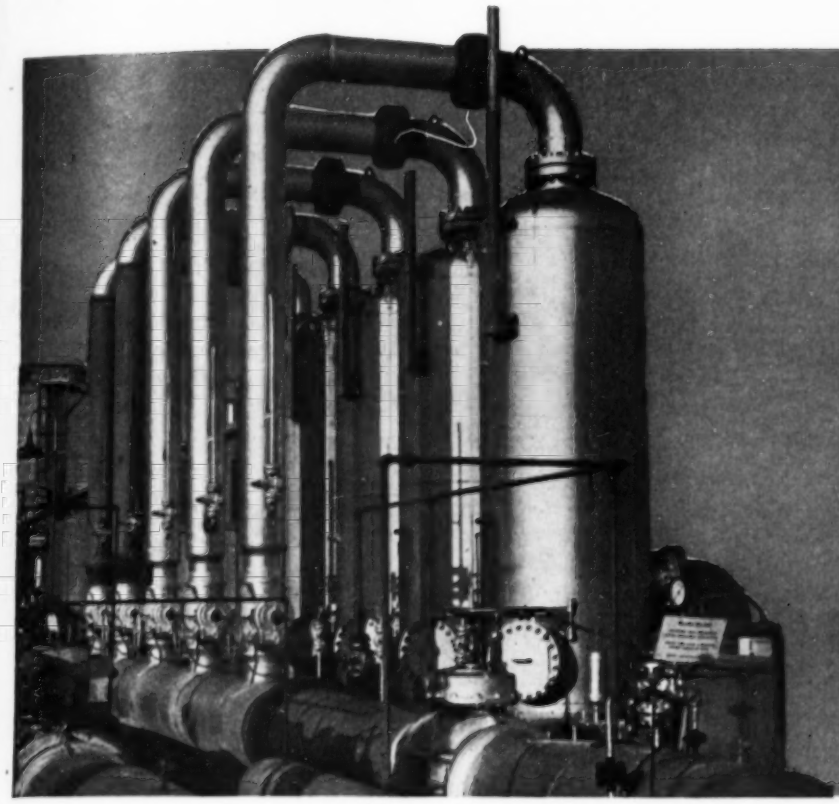
Accurate, Safe Control

of tremendous pressures is an ever present problem in the gas field. Reynolds field Regulator illustrated at left is one of the many high pressure regulators built by Reynolds. It is thoroughly tested and proved in service. It handles up to 1,000 pounds safely reducing same to pounds. For more than fifty-five years Reynolds has designed and built gas regulators. Safety, accurate performance, years of service—these are some of the built-in factors responsible for Reynolds enviable position in the Gas Control Field.



Reynolds Gas Regulator Co.
ANDERSON, INDIANA, U. S. A.
GAS CONTROL SINCE 1892

There's NO RECESSION in the Gas Industry



Nearly three billion dollars will be spent on new construction alone by gas companies in the three years, 1954—1956.

Pipe line construction this year will hold last year's pace—and the 1954 distribution budget is the highest in history, to serve the hundreds of communities getting natural gas for the first time.

TO SELL THIS MARKET . . . you need the COMPLETE coverage given ONLY by GAS.

Recipients of GAS must be "people who control and influence the buying of equipment, appliances, and services in the gas industry." And they must assure us periodically, in writing, that they are *reading* GAS and want to continue to receive it.

Selection of these readers is made by manufacturers who are successfully selling the gas industry. They pick the men in *all* worthwhile companies that *they* want to reach . . . and these are the same men *you* must reach to make sales.

Every man on the controlled circulation of GAS is a man of known importance in the selection of products and services for his company.

And the Circulation of GAS is
99.37% VERIFIED BY BPA

BPA VERIFIED CONTROLLED Circulation sets the highest standards ever required by *any* audit bureau . . . for BPA VERIFIED CONTROLLED *must* correspond to the publisher's stated standards of recipient eligibility . . . and must be verified within two years—not three years, as in other audits.

GAS is the only publication with complete coverage of this multi-billion dollar market . . .

More circulation . . .
More editorial pages per issue . . .
More advertising pages per issue . . .
Lower advertising cost per thousand circulation . . . *than any other gas industry publication.*

● *Advertising pages up 19% first 4 months 1954*

A Jenkins Publication • 198 S. Alvarado St., Los Angeles 57, Calif.

a table of mask equipment showing the parts required for each individual application.

Acme Protection Equipment Co.

■

12 Technical Bulletins

Ansul Chemical Co. has made available its entire list of 15 technical bulletins covering recommended procedures for protecting many difficult and unusual fire hazards. Included in the list of bulletins are ones on natural gas fire tests, and recommended fire protection of liquefied petroleum gas storage, unloading and processing areas.

Ansul Chemical Co.

13 Tube and Pipe Folder

A new folder, designed for engineers involved in the selection of stainless tubing and pipe for corrosion resistance applications, has been issued by the Tubular Products division of the Babcock & Wilcox Co. The eight-page folder contains information on the comparative corrosion resistance of stainless steels to corrosive media and presents pertinent data on six widely used stainless tubing steels and several hundred corrosive media at various temperatures and concentrations.

Tubular Products Div.
Babcock & Wilcox Co.

"This Quality Control Number is Your Proof that M·S·A FIRST AID KIT Items are Fresh, Pure, Sterile"

Every step in manufacture, all supplies that go into the new M.S.A. First Aid Kits are keyed to the number stamped on each Unit "D" package. This identity is your assurance of *individual responsibility* on our part . . . the best possible guarantee of product protection to you.

MORE THAN 60 ITEMS GIVE YOU COMPLETE SELECTION

You name it, we have it! 12 different packages of antiseptics; 15 various kinds and sizes of bandages and dressings; over 21 burn treatments; and more than 15 miscellaneous items, including eye treatment, snake bite kits, poison ivy ointments, and many others. Write for details.

MSA SAFETY EQUIPMENT HEADQUARTERS

MINE SAFETY APPLIANCES CO.
201 North Braddock Avenue, Pittsburgh 8, Pa.
At Your Service: 82 Branch Offices in the United States and Canada

People

Promotions

K. W. Stookey

J. C. Calhoun

Gas Machinery

J. C. CALHOUN JR., vice president and secretary, has been elected president of the Gas Machinery Co. The Cleveland, Ohio, company also named ROBERT KYLE and K. W. STOOKEY first and second vice presidents, respectively.

T. W. Dunn
Carlon

Robert Kyle
Gas Machinery

THOMAS W. DUNN has joined Carlon Products Corp., Cleveland, as general sales manager and will be in charge of sales from all eight of the company's plants. E. S. MORELAND, who will act as assistant general sales manager, is curtailing his activities as sales director because of ill health.

W. PAUL LANCEFIELD has been promoted to superintendent of customers' office of the Portland (Ore.) Gas & Coke Co., succeeding the late Paul F. Leary. VIRGIL T GELLATLY succeeds Mr. Lancefield as assistant superintendent.

SAM B. CHASE JR., who has been a legal counsel of the Montana Power Co., Butte, was elected vice president and counsel of the utility.

DR. AUGUSTUS B. KINZEL has been appointed director of research, Union Carbide & Carbon Corp., New York.

SPENCER H. MIERAS has been named general manager of Bonney Forge & Tool Works, Allentown, Pa., and KENNETH FOUST is now secretary-treasurer.

WALTER P. HOOPER has joined Panellit Inc., Skokie, Ill., as administrative vice presi-

dent of Panellit and its two divisions, Panalarm and Panascan.

Reorganization of its New England territory by Servel Inc. has resulted in the appointment of W. LEINSTER FARMER as sales manager for the New Haven (Conn.) district, which includes western Massachusetts, Vermont, Connecticut, and Rhode Island. The Boston district, under the managership of JOHN F. MYERS, will include Maine, New Hampshire, and eastern Massachusetts.

GEORGE E. DUANE has been succeeded as head of the industrial gas department of the Dayton (Ohio) Power & Light Co. by CHESTER GILLUM, assistant supervisor. Mr. Duane has retired after 27 years as head of the department.

MILTON E. CASE has joined Robertshaw-Fulton Controls Co., Greensburg, Pa., as chief internal auditor.

THOMAS C. AGAIN, formerly assistant chief engineer at the Nordstrom valve plant in Oakland, Calif., has been named chief engineer of Rockwell Manufacturing Co.'s new valve plant at Sulphur Springs, Texas.

Whirlpool Corp., St. Joseph, Mich., has appointed FREDERICK S. UPTON as senior vice president, MASON SMITH as finance vice president, and E. C. CUDMORE as controller, a newly created corporate position.

STUART E. MCMURRAY has been elected treasurer of the Peoples Natural Gas Co., Pittsburgh, succeeding H. D. BORGER, formerly vice president and treasurer, who has relinquished the treasurer's office owing to the press of other duties.

WARREN N. FAIRLEE has succeeded A. A. CHARONNAT as superintendent of stores of Pacific Gas & Electric Co. Mr. Fairlee has been assistant superintendent of stores at the company's central warehouse in Emeryville, Calif.

A. O. Smith Corp., Milwaukee, has named RICHARD H. HEILMAN to succeed the late RICHARD H. ZASTROW as general traffic manager. The company also named WARREN HENDRICKSEN to fill the newly created post of general sales manager of its process equipment division.

CHARLES UNRUH, formerly with the company's Grayson division, has joined Robertshaw-Fulton Controls Co. as Pacific Northwest sales representative with headquarters in San Francisco.

MARTIN B. JAEGER has been promoted to publicity manager of Bucyrus-Erie Co., S. Milwaukee, succeeding EMORY M. HEUSTON, who left the company recently.

RALPH T. MCELVENNEY, president of the American Natural Gas Co., has been

THE NORMAC BELL JOINT CLAMP

A SIMPLE SOLUTION for one of the GAS INDUSTRY'S *most trying problems*

Solves Your Joint Repair Problems • Quick • Easy • Permanent

Installed in small pavement openings. Available in all standard sizes from 3" to 12". A simple set of tools cleans the joint, installs the clamp . . . often in only a quarter of an hour. SAVES TIME. SAVES MONEY and the repair is permanent. Designed for all conditions particularly where pavement repair costs are prohibitive. Such small opening repairs are scarcely noticeable when pavement is replaced.

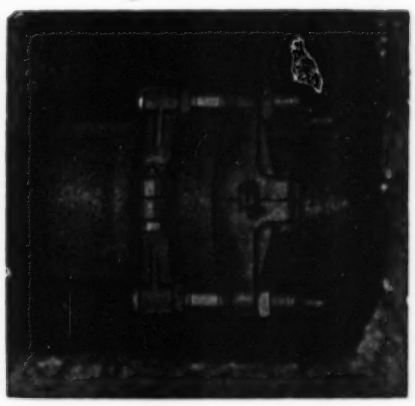
Normac Clamps can be installed in large as well as small openings.

Norton-McMurray hold definite leadership in the development of methods for installation and rehabilitation work through small openings. We welcome the opportunity to help solve a problem you may have—tell us about it.

Write for our catalog describing our complete line of

COUPLINGS . . . FITTINGS . . . SERVICE TEES and ELLS . . . SLEEVES . . . COMPRESSION-END COCKS . . . METER BARS and BRASS FITTINGS for copper pipe.

6 inch Normac Clamp being lowered into hole for installation



6 inch Normac Clamp in service after installation

NORTON-McMURRAY MFG. CO.

122 SOUTH MICHIGAN AVENUE • CHICAGO 3, ILLINOIS

Method and product covered by U. S. Patents, Nos. 2,163,261 and 2,178,286.

elected chairman of the board of Michigan Consolidated Gas Co., Michigan Wisconsin Pipe Line Co., American Louisiana Pipe Line Co., and American Natural Gas Service Co.

MERLE E. ORELUP, Oklahoma City district superintendent of the Oklahoma Natural Gas Co., has been named general air conditioning engineer in the general sales department in Tulsa.

In line with Caloric Stove Corp.'s plans to expand its office and warehousing facilities in the Midwest, DWIGHT SUTHERIN, midwest division sales manager, will relocate in Kansas City, Mo., where he will establish facilities to serve a 10-state area.

Dwight Sutherin
Caloric

R. A. Newbold
Manufacturers

A. B. Lauderbaugh

W. A. Stermer
Manufacturers

Several promotions have been announced by Manufacturers Light & Heat Co. and other Pittsburgh Group companies. RAY A. NEWBOLD becomes employee relations director; WALTER A. STERMER becomes industrial sales manager; and A. B. LAUDERBAUGH moves up to assistant vice president. He has been chief engineer of the companies since 1952.

ROBERT E. WILLIAMS has been promoted to assistant vice president of Binghamton Gas Works, Keystone Gas Co. Inc., and Home Gas Co., all Pittsburgh Group affiliates of Columbia Gas System.

EARL G. PLAYFORD, business promotion manager of the Ohio Fuel Co. in the Toledo district, has been promoted to business promotion coordinator of the Columbia Gas System in New York.

Columbia Gas System Service Corp. has elected ROBERT C. SLOAN, executive accountant in charge of the accounting department, to the post of assistant treasurer.

Lone Star Gas Co., Dallas, has made the following appointments: L. A. BICKEL to assistant general manager of the Dallas division of distribution; J. R. BUSH to general superintendent of distribution properties in Fort Worth; and PAUL MCBURNETT as editorial assistant to the editor of *Blue Blaze*, employee newspaper.

Changes in the organization and personnel of Hamilton Manufacturing Co.'s sales department have resulted in the appointment of ROBERT T. HOOPES as sales coordinator. Under his direction the central sales office will handle general sales activities for all lines. C. H. RIPPE has been named sales manager for the home appliance division; J. W. CHRISTENSEN will head up an accelerated sales promotional program for the home appliance division.

ELMER F. E. SCHMIDT, formerly director and senior vice president of Lone Star Gas Co., Dallas, has opened an office for natural gas consulting services in Dallas.

JOHN A. FRY, former president and treasurer, has succeeded WILLIAM T. BARBOUR as chairman of the board of Detroit-Michigan Stove Co. FRED A. KAISER advances

Extra Margins of Profit!

Lancaster S-7 GROOVE TYPE METAL RIM DIAPHRAGM

Performance advantages of the Lancaster S-7 mean a closer to 100% overall accuracy — and an extra margin of profit. Patented Lancaster features and superior quality construction add up to more years of service in the meter — and another margin of extra profit.

If you are not using the Lancaster S-7 groove type metal rim diaphragm for your small meter repairs and replacements, write for a sample today.

Lancaster METER PARTS CO.
POST OFFICE BOX 378 • LANCASTER, OHIO

to president from executive vice president, and HERBERT J. OTTER from credit manager to treasurer. THOMAS E. BARBOUR was elected to the board.

SHERMAN L. SIBLEY has been named assistant to the vice president and general manager of Pacific Gas & Electric Co., San Francisco.

E. B. HILL, vice president, has been named director of sales, advertising and export for all corporation products of Gar Wood Industries, Wayne, Mich.

E. L. DE GOLYER, internationally known petroleum geologist and oil executive, has been elected to the board of directors of Dresser Industries Inc., Dallas.

P. W. Rogers
Ohio Fuel

C. Bronaugh
Standard Magnesium

PAUL W. ROGERS, chief engineer of the Ohio Fuel Gas Co., has been elected an assistant vice president of the company.

CHARLES BRONAUGH has joined the sales staff of Standard Magnesium Corp., Tulsa. He has been assigned to the central and the southeast coastal states.

J. WILLARD POTTER JR., editor and general manager of the Pomeroy (Ohio) *Daily Sentinal*, has resigned to join the information department of the Ohio Fuel Gas Co., Columbus.

Honors

N. HENRY GELLERT, president of Seattle (Wash.) Gas Co. has accepted an appointment to the U. S. Chamber of Commerce committee on economic policy.

W. T. NIGHTINGALE, president of Mountain Fuel Supply Co., Salt Lake City, Utah, has been elected president of the Salt Lake Chamber of Commerce.

WILLARD F. ROCKWELL, board chairman of Rockwell Manufacturing Co., Pittsburgh, has been elevated to the grade of Fellow in the American Society of Mechanical Engineers.

Deaths

CARL L. HERRMANN, 52, president of the Pittsburg Water Heater Sales Co., Los Angeles, died recently. He had been ill for some time with a heart condition.

● drives anywhere at 12.6 m.p.h.

● digs main lines and laterals

● undercuts walks, curbs, old mains

● makes vertical set-in —saves hand work

● backfills its own trench

Rubber-tired TRENCHMOBILE saves a lot of time and costly hand labor on utility trenching. Its 12.6 m.p.h. "drive-anywhere" mobility steps up work schedules on scattered, small-yardage jobs . . . ideal for house-to-curb service connections, pipe reclamation, trouble-shooting. Trenchmobile also fits requirements for main line excavations. It opens trenches 8 to 16 inches wide, 5 feet deep . . . digs up to 14½ ft. per min.

There's little or no hand clean-up because Trenchmobile undercuts sidewalks, old mains . . . makes vertical set-ins flush with foundations . . . backfills its own trench (blade optional). Get all the details. See Parsons distributor, or write us.

(Also: 5 large crawler-type models).

to: PARSONS COMPANY, Newton, Iowa
Send bulletin on 43.6 HP Model 88 Trenchmobile

NAME _____
TITLE _____
COMPANY _____
DIVISION _____
STREET _____
CITY _____

P362REV.GAS

PARSONS Trenchmobile
(Koehring Subsidiary)

NEWS

Anti-strike laws may be clarified by Supreme Court

Clarification of constitutional questions as to how far states can go in attempting to outlaw strikes in public utilities may result from a petition to the U. S. Supreme Court for review of a Virginia supreme court of appeals decision having the effect of upholding the validity of the Virginia public utility anti-strike act.

The Virginia anti-strike act was revised in 1952 in a move intended to remove any doubts of constitutionality resulting from a Supreme Court opinion the preceding year invalidating a Wisconsin public utility anti-strike law.

About a dozen states now have varying types of anti-strike laws, most of them enacted in 1947. Florida's anti-strike law was ruled unconstitutional last year by the state supreme court.

What action the U. S. Supreme Court takes with respect to the Virginia case will attract widespread interest in view of the fact the proposals for further enactment of such laws are expected next year, when the legislatures of 44 states will convene in regular session.

Eclipse Fuel's Canadian plant nears completion

Completion is expected this month of a new plant in Toronto, Ontario, for Eclipse Fuel Engineering Co.'s Canadian subsidiary, Eclipse Fuel Engineering Co. of Canada Ltd.

The modern structure will have facilities for limited manufacture, asembly and stock shipment of gas- and oil-fired heating appliances. More than 10,000 sq ft will be devoted to shop, engineering, and office space, permitting increased service from an enlarged sales and service staff.

Electric industry's use of gas gaining rapidly

Trends in statistics from the FPC show that natural gas is gaining heavily this year in use as a boiler fuel in electric power plants, largely at the expense of oil. Countrywide, coal is a little more than holding its own in competition with gas as power plant fuel, although in some areas it, too, has lost ground to gas.

In the FPC's report on electric utilities' fuel consumption in the first four months of this year and last year, the power plants burned 47.8 billion cu ft more gas this year than last, an 18.1% increase. Meanwhile, oil consumption dropped by 4.5 million bbl, or 15.2%, and coal used increased 1.5% (554,000 tons). Only a million-ton rise in consumption in the coal-burning East South Central states kept coal out of the minus column.

The Pacific Coast showed the biggest shift from oil to gas, where gas consumption increased 87.5%, or 18.9 billion cu ft over the first four months of 1953. Oil was down 31.7% from last year.

In other sections, the shifts in fuel use in electric production were:

Middle Atlantic: Gas, up 34.8%; oil, down 15.7%; coal, down 4.6%.

New England: oil, down 2.4%; coal, up 10.6%; gas, although used hardly at all last year, showed an appreciable increase.

East South Central: Gas, up 13.3%; coal, up 44.1% (very little oil used).

East North Central: Gas, up 5.8%; oil, down 1.2%; coal, down 1.8%.

West Central: Gas, up 5.5% (this area consumes 40% of all gas used for electric generation); oil and coal were both down.

West North Central: Gas, up 11.5%; coal, up 3.8%; oil, down 8.4%.

South Atlantic: Gas, up 32.6%; coal, up 1.3%; oil, down 8.7%.

Mountain: Gas, up 21.3%; coal, unchanged; oil, down 35.8%.

Actually, the increased use of gas during the first four months of 1954 is a continuing trend that became apparent last year when the electric utilities burned 13.4% more gas than in 1952. This year's slump in oil use, however, reverses last year's trend, when power plants burned 22.4% more oil than in 1952.

Perhaps reflecting the effects of the increased use of gas was the recent action of the National Coal Association, which asked all candidates for public office, especially for Congress, to go on record for steps to bar use of oil and gas under boilers where coal can do the job. President Eisenhower is to name a committee shortly to explore what, if anything, the government can do to help keep coal from losing more markets.

Therm rate basis sought by Portland Gas & Coke

In addition to asking the Oregon Public Utilities Commission for increased rates, Portland (Ore.) Gas & Coke Co. has requested that the new rate schedules be expressed in units of therms rather than in units of 100 cu ft, as at present.

Company President Charles H. Gueffroy said this change to a more modern and simplified method of billing is in anticipation of natural gas.

Gas sales and revenues gain in first quarter

Total revenues of gas utilities and pipelines from sales of gas to ultimate consumers (not including sales to other utilities for resale) for the first quarter of 1954 were $1030 million, a gain of 13.9% over revenues of $904 million in the comparable quarter of 1953, the American Gas Association reports. For the 12 months ended March 31, 1954, revenues from sales to consumers totaled $2824 million, a rise of 11.6% over $2531 million in the previous 12-month period. Industrial gas revenues rose 14.2% during the 12-month period, while residential revenues gained 10.3%.

Total operating revenues of the gas utility and pipeline industry reached a record high of $4325 milion during the 12 months ending March 31, 1954. This is a gain of $601 million, or 16.1% over the figure for the comparable period one year earlier. Net operating revenues increased from $521 million to $558 million in the same period, a

Twenty years of business flying have culminated in ownership of three consecutive Beechcraft Bonanzas for Roy L. Harrison, president of Peoples Natural Gas Co., Omaha. Most of the hours logged yearly by Mr. Harrison are in connection with personal inspections of the extensive territory of Peoples, which covers 90 communities in seven states.

gain of 7.1%. Net income was $407 million in the cumulative period, a change from the year earlier of 4.9%.

Sales of gas in the first quarter of 1954 amounted to 19,042 million therms, an increase of 9.9% over the 17,331 million therms sold in the same quarter of 1953. For the 12 months ended March 31, 1954, sales of gas aggregated 58,095 million therms, an advance of 7.9% over 53,842 million therms in the comparable period a year earlier.

On March 31, 1954, a total of 27.0 million customers of all classes were receiving utility gas, an increase of about 2.9% over 26.2 million customers served a year earlier. In addition, 305,000 customers receive LP gas through mains, and are excluded from the totals above.

Revenues from the sale of natural gas to ultimate customers for the first quarter of 1954 were $881 million, an increase of 16.4% over $757 million a year earlier. For the 12 months ended March 31, 1954, natural gas revenues were $2375 million, or 15.0% above revenues of $2065 million in the previous 12-month period.

Anchor provides storage for northeastern users

One of the nation's largest underground propane gas storage plants was opened last month by Anchor Petroleum Co., marking the beginning of a new service to users of propane in the northeastern United States.

The new installation, located just outside Bath, N. Y., features a special dehydration unit that removes all moisture from the gas. The equipment is identical to that used in other Anchor underground storage plants at Hattiesburg, Miss. and Midland, Texas.

O. L. Rush is superintendent of the new plant and P. E. Gray is resident engineer.

Kentucky city acts to assure adequate gas supply

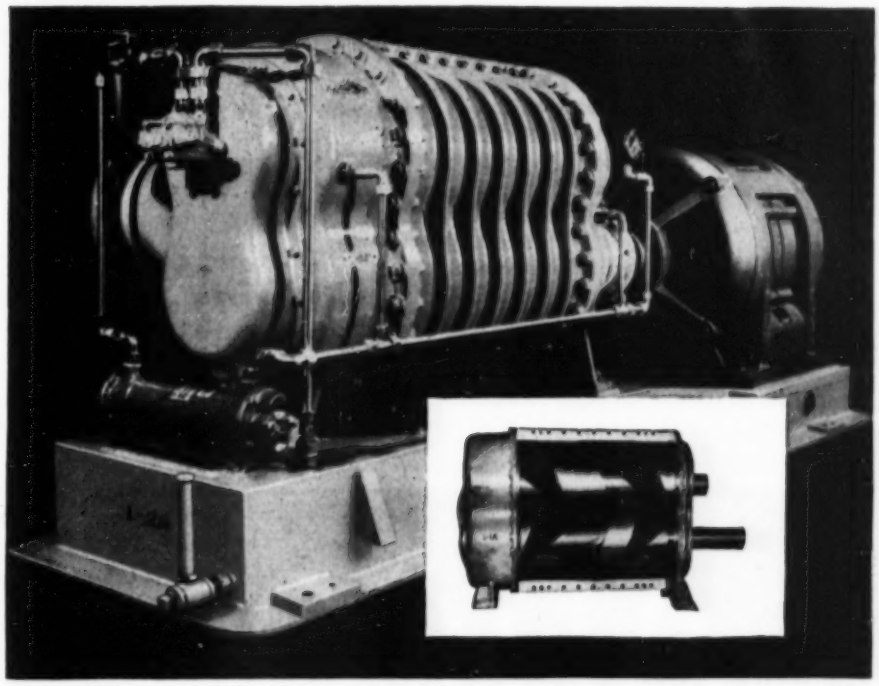
To make sure that the city has an adequate supply of gas heat next winter, the Somerset, Ky. city council has let a contract to build a 34.2-mile, 6-in. pipeline to bring 7 MMcf of gas a day to the city.

The $350,000 line, which will supplement the supply of gas the city now receives from other sources, will connect with Texas Eastern Transmission Corp.'s mainline at Weiss in Casey county.

Seattle Gas participates in civil defense exercise

Seattle (Wash.) Gas Co. projected itself into future natural gas operations recently when it participated in the city's civil defense staff exercise, part of a simultaneous nationwide test.

As the problem unfolded in the 24-hour



Wide range of pressures and capacities add new opportunities for economy with R-C SPIRAXIAL® COMPRESSORS

The 10 sizes now available in the new Roots-Connersville SPIRAXIAL COMPRESSORS provide a capacity range from 700 cfm to 5,000 cfm, with pressures from 15 psi to 30 psi, in single-stage units. Where greater air volumes are required, multi-stage installations are completely practical. The result is that the amazing efficiency and economy of this latest R-C development can be utilized in many applications not fitted to the earlier SPIRAXIAL machines.

Already, users of R-C SPIRAXIALS are profiting from these outstanding advantages:

1. **No internal lubrication—hence oil-free air**
2. **Peak efficiencies at required pressures**
3. **Direct-connected for speeds of 1750 rpm and 3550 rpm**
4. **Uncooled—requiring no water-jacketing**
5. **Small space . . . low noise level**

If you are planning new installations, we suggest a study of the possible economies of R-C SPIRAXIALS. Or, it may well be that SPIRAXIALS will pay for themselves as replacements for present less efficient equipment.

Ask for details in Bulletin SC-253, or for an analysis of your needs by R-C engineers.

ROOTS-CONNERSVILLE BLOWER

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exercise held by Seattle's city department and utility heads, civil defense headquarters staff and zone leaders, it became apparent that Seattle Gas Co.'s present manufacturing facilities had been made inoperative. In theory, the city was without gas and would be for a considerable length of time.

However, it was assumed that natural gas was already available and, under these conditions Seattle Gas was able to work in close cooperation with the city's fire, water, engineering and other departments, and to maintain service to a large segment of its customers, including defense industries. Sectionalizing of the company's distribution system, already worked out in anticipation of the coming of natural gas, made this possible.

The exercise provided a good opportunity for the company's distribution engineers to familiarize themselves with its new valving system, which will use plug-type instead of gate valves, making it possible to isolate and continue operations in undamaged areas during such emergencies.

San Diego Gas' JA group advisers receive award

An award as "best adviser team," was won by Jack Graham, E. B. Kipp, and Dan Turner of San Diego (Calif.) Gas & Electric Co. when the Zip-A-Key Case Co. closed its books recently after establishing a record as one of the most outstanding Junior Achievement groups in the three-year history of JA activity in the area.

In winning the award, the three men matched the record of C. W. DeVoe, Les Kobler, and Lyle Jones, who won a similar award last year for their work with another company-sponsored Junior Achievement group.

In competition with 23 other JA companies in the San Diego area, Zip-A-Key won top award for outstanding achievement as the "best operating company." Its gross sales exceeded $1000, a mark that had never been reached by a San Diego JA company.

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One bell of the instrument is filled with gas which is being measured, and the other bell is filled with dry air. Otherwise, except for the new instrument having one column for gas and one column for dry air, the unit is identical in operation to the standard gas gravitometer. When calibrated and properly installed, these instruments require little attention other than to wind the clock, ink the pen, and change the chart. Send for bulletin No. 101.
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SoCal itemizes bill in motion picture

In a 20-minute motion picture produced by Southern California Gas Co., Los Angeles, the company shows what happens when it itemizes a gas bill. The feature role in the picture, "Tenth of the Month," is the bill itself.

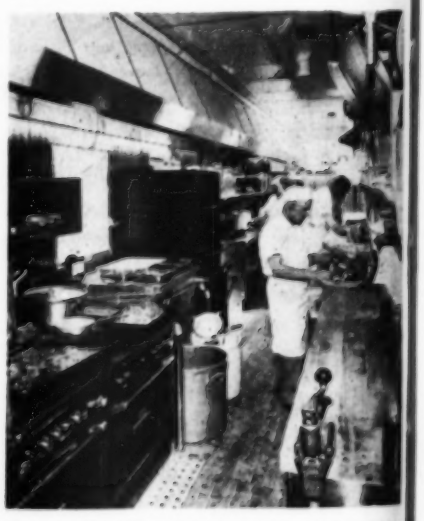
The 8-ft long bill, which resulted when a housewife told the gas company that her husband demanded itemized bills, depicts the company's costs of doing business.

Following showings to an estimated 5500 company employees, SoCal has made the film available to community, service and civic groups.

World's biggest diner is all-gas operation

The world's biggest diner, which opened recently in Bloomfield, N. J., depends upon gas not only to feed its potential 100,000 customers a month but also to keep them cool in the summer and warm in the winter.

Symbolic of a booming industry that prefers gas for a fuel and has become a tre-



The galley-like kitchen of the world's largest diner showing the range, broiler, and deep fat fryers.

mendous market for gas appliances, the diner has a full-sized basement housing a fully equipped bakery as well as the gas water heaters, gas-fired boiler, gas air conditioner and water chiller. These installations are the reason that the Public Service Co. of New Jersey, which worked closely with the owners on appliance installation plans, estimates the diner will use 300 Mcf of gas a month.

According to Fodero Diner Car Co., builder of the new diner, they always advise gas equipment for diners because "there is no loss of time in getting instant heat and no need to wait for coils to warm up."

Kitchen equipment includes a large Vulcan oven for roasting large items; a Vulcan range for heavy top burner work; an upright Magic Chef broiler; two Anets deep fat fryers; four open burners for individual preparation of eggs; short-order grill; two Savory gas toasters; and a small ice box.

In the basement is a 25-ton Servel water chiller; two 250-gal. A. O. Smith water heaters, and a Bryant gas-fired boiler. A Blodgett oven is used in the bakery.

New 13-month high hit by water heaters

When 200,300 gas-fired water heaters were shipped during May, a new 13-month high was hit. This figure is 11.9% higher than last May. During the first five months of 1954, 928,300 units were shipped compared to 958,900 last year.

A 30% increase was shown in May shipments of central heating equipment, according to GAMA estimates, when 74,400 units went out. During the first five months a total of 270,000 were shipped. Gas-fired furnaces were up 23%; boilers up 38.6%; conversion burners up 44.3%.

Gas range shipments were down 17.3% from last year during May, when 149,600 were shipped. The five-month figure stands at 798,400, whereas last year it stood at 964,000. During the first four months of this year, 479,600 electric ranges and 648,800 gas ranges were shipped.

Municipal league asks cut in Colorado rates

The Colorado Public Utilities Commission was scheduled to hear arguments on demands for an immediate $362,000 natural gas decrease by Public Service Co. late in July.

The Colorado Municipal League and the city of Denver had asked for the cutback to be effective July 1, claiming the $1,748,000 emergency rate increase granted by the PUC early this year was greater than the added cost it brought on. Noting that the $1,748,000 boost was based on the company's estimate that wholesale gas rate increases would cost the company more than $2 million a year, the league says that later

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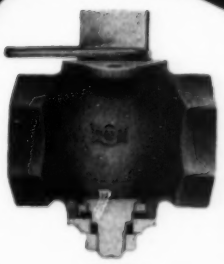
Iron Body, Galvanized,
Bronze Plug Stop



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Lockwing—Iron Body,
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Black or Galvanized
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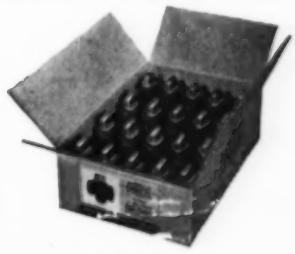
for Over 80 Years



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HAYS MANUFACTURING CO.
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testimony by a company witness in an electric rate case revealed that the wholesale increase will cost the company only $1,594,381.

Low-cost TV plan devised by Princeton Film Center

A new development in the field of TV public service programming has been devised by the Princeton Film Center that makes it possible for the film produced by a manufacturer or other group to reach 3.6 million TV viewers at a total cost of $2000 by using public service program time.

The cost is based on the low charge of $10 per television station showing. Thus, if the film is shown by 200 stations at $10 per showing, the cost is $2000.

Princeton Film Center has designed this service in such a way that it takes advantage of the tremendous amount of TV time that must, by law, be devoted to public service features. Each of the nearly 400 TV stations in the country is required by FCC ruling to devote a portion of its air time to programs in the public interest.

Additional information on the plan is available from the center, which has offices in New York, Philadelphia, and Princeton, N. J.

Top business, civic and military officials gather for dedication of new research and development laboratory at Anaheim (Calif.) division of Robertshaw-Fulton Controls Co. T. T. Arden, executive vice president is shown on steps during dedication ceremonies.

If It's a Molded Diaphragm ... We Can Make It

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TO.....

STREET..... ZONE.....

STATE.....

News Notes

Pennsylvania Public Utility Commission will hold a hearing on the complaint of the Anderson Natural Gas Co., Butler, that if the T. W. Phillips Co. stops supplying gas to Anderson it will deprive 200 consumers of all service and leave insufficient quantities for other customers. The Phillips company seeks to stop supplying Anderson on the grounds that it wants to conserve its fuel for its own residential consumers.

An appliance exhibit with a fresh flavor —orange, grape, and strawberry—was a popular center of attraction at the recent home shows in Chattanooga and Knoxville, Tenn. The flavor center was a Servel automatic ice-maker, which produced more than 6000 flavored ice-circles after fruit-flavored syrups and water had been put into the refrigerator's ice-making mold.

Bucyrus-Erie Co., S. Milwaukee, Wis., has issued a 16 mm. sound-color motion picture entitled "These Users' Views," which depicts

more than 30 different excavating, loading, and material handling jobs of the company's line of ⅜- to 4-cu yd general purpose excavators and cranes. The picture story of these job applications is combined with actual quotations from owners and operators into an audio-visual presentation.

Ohio Gas Co.'s request to freeze new home space heating installations was approved temporarily by the Public Utilities Commission of Ohio. The Bryan, Ohio, company asked for the freeze until Panhandle Eastern Pipe Line Co. can assure the company that an additional supply of gas will be available.

To give public recognition and tribute to outstanding acts of heroism and first aid rendered by any person affiliated with the petroleum industry, the American Petroleum Institute has established a meritorious safety award. The award consists of a certificate citing details of the act, a medal en-

Inadequate PR indicated by AGA survey

More than half of the 67 companies with 11.6 million meters that responded to a recent public relations survey conducted by the AGA have no organized public relations program.

Other facts revealed by the survey:

Only eight companies under 100,000 meters have an organized PR program. Three of these are straight gas companies, the remainder are combination.

Nearly all companies, including those with no organized public relations program, reported numerous immediate and long-range PR programs.

Fifty-three companies reported that PR activities are the responsibility of one person.

Public relation activities are directly conducted by:

PR department, 13; full-time director of PR, 10; outside agency, 2; local managers, 10; employees generally, 8; advertising or public relations department, 5; vice presidents, 4; information department, 2; secretary, 2; editorial department, 1; president, 1; not specified, 9.

Companies were asked whether they would or would not purchase ad space in local media to support a mat service on a free enterprise theme. Replys showed 12 companies would (1.7 million meters); 19 companies would not (3.8 million meters); 14 companies qualified (3.1 million meters).

DAVEY ··· TODAY'S BEST COMPRESSOR AND TOOL INVESTMENTS!

Davey Model 210 Super Chief

From the standpoint of original investment — and reduced operating costs — *you get more for your money with Daveys.*

DAVEY MULTI-PORT VALVES require less engine power and less fuel . . . never carbon or foul . . . assure constant full volume of air, keep tools operating at top efficiency. And, they're only one of many features of today's fine Davey lightweight, heavy-duty compressors in 60-125-160-210-315-500-600 c.f.m. sizes.

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Davey Rock Drills, 4 sizes 28 to 58 lbs.

For complete details, see your nearest Davey distributor!

Davey Paving Breakers 4 sizes—35 to 90 lbs.

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DAVEY COMPRESSOR CO.
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AT LOWER COST

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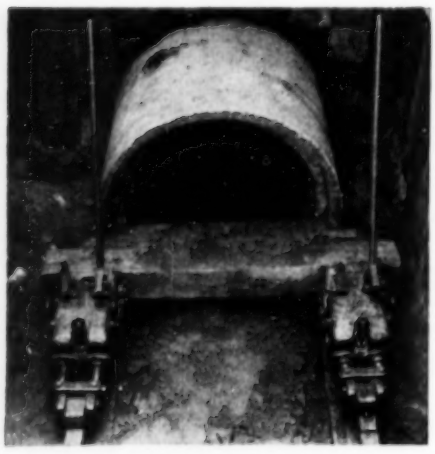
Here's the simple, cost-cutting way to install underground pipe. Speed your jobs with a GREENLEE Pusher. One-man-operated, portable, simple to operate. No tearing up of pavement . . . eliminates extensive ditching, tunneling, backfilling, tamping, repaving. Cuts job time to a fraction. GREENLEE Hydraulic Pipe Pusher often pays for itself on first job. Two sizes — model shown above for pushing 3/4" to 4" pipe. Larger unit, below, for pipe over 4", concrete sewer pipe and large drainage ducts. Power pump (as shown above) also available for extra ease and speed of operation.



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CALENDAR

August

13..SGA Pipeline Operations and Pipeline Engineering Conferences — Rice Hotel, Houston.
20..SGA Natural Gas Gathering and Natural Gas Processing Conferences — Capt. Shreve Hotel, Shreveport, La.
23-25..Appalachian Gas Measurement Short Course — West Virginia University, Morgantown, W. Va.

September

8..NEGA Joint Customer Service Managers Group and Manufacturer - Distributor Division — Wachusett Country Club, West Boylston, Mass.
8-10..31st Mid-West Gas School and Conference, Iowa State College — Hotel Sheldon-Munn, Ames, Iowa.
8-10..Pacific Coast Gas Assn. — Vancouver, British Columbia.
10..New Jersey Gas Association —Hotel Monmouth, Spring Lake, N. J.
10..SGA Compressor Station Operation Conference — Jung Hotel, New Orleans.
13..SGA Distribution Operating Conference — Henry Grady Hotel, Atlanta, Ga.
13-14..Independent Natural Gas Association of America Annual Meeting — Roosevelt Hotel, New Orleans.
15-17..AGA Accident Prevention Convention — Bond Hotel, Hartford, Conn.
17..NEGA Industrial Division — Wachusett Country Club, West Boylston, Mass.
17..SGA Distribution Operating Conference — Rice Hotel, Houston.
17..NGAA Oklahoma Regional Meeting — Skirvin Hotel, Oklahoma City.
17-18..Maryland Utilities Assn., Fall Conference — Virginia Beach, Va.
24..Oklahoma Utilities Association Gas Division Meeting —Biltmore Hotel, Oklahoma City.
27-29..Electrical Conference of Petroleum Industry (Petroleum Industry Committee, AIEE) —Mayo Hotel, Tulsa.
28-29..Texas Mid-Continent Oil & Gas Assn. — Baker Hotel, Dallas.
30..SGA Transmission Management Conference — Shamrock Hotel, Houston.

October

7-8..California Natural Gasoline Assn. Annual Fall Meeting. Ambassador Hotel, Los Angeles.
10-13..Controllers Institute of America — Edgewater Beach Hotel, Chicago.
11-13..AGA Annual Convention — Atlantic City, N. J.
18-22..National Safety Council — Chicago.
29..NGAA Southern Regional Meeting—Blackstone Hotel, Tyler, Texas.

November

1-5..National Metal Exposition—Chicago, Ill.
4..NEGA Operating Division — Hotel Statler, Hartford, Conn.
8-11..American Petroleum Institute—Conrad Hilton Hotel, Chicago.
15-17..American Standards Association—Hotel Roosevelt, New York.
17..NEGA Safety Conference — Hotel Statler, Boston.
17-19..Southeastern Gas Association —Sir Walter Hotel, Raleigh, N. C.
17-19..Wisconsin Utilities Association, Electric & Gas Section, Technical & Sales & Service Divisions — Hotel Schroeder, Milwaukee.
28-3..American Society of Mechanical Engineers — Statler Hotel, New York.

December

7..NEGA Appliance Servicing Conference — Hotel Statler, Boston.

1955

January

18..NEGA Operating Division— Hotel Statler, Boston.

March

7-9..Mid-West Gas Association— St. Paul Hotel, St. Paul, Minn.
7-11..National Association of Corrosion Engineers — Palmer House, Chicago.
24-25..AGA Gas Supply, Transmission & Storage Conference— William Penn Hotel, Pittsburgh.
24-25..NEGA Annual Meeting — Hotel Statler, Boston.
24-25..Oklahoma Utilities Association Convention — Mayo Hotel, Tulsa.

April

12-14..AGA Sales Conference on Industrial & Commercial Gas —Hotel Statler, Boston.
12-15..AGA Distribution, Motor Vehicles & Corrosion Conference — Netherland Plaza, Cincinnati.
19-21..Southwestern Gas Measurement Short Course—University of Oklahoma, Norman.
25-27..Mid-West Regional Gas Sales Conference—Edgewater Beach Hotel, Chicago.

cased in a transparent block of lucite, and a lapel pin.

Dresser Industries Inc. has announced the sale of one of its operating units, Kobe Inc., Huntington Park, Calif., manufacturer and distributor of hydraulic oil well pumping equipment. Principals in the purchase were a group of investors headed by C. J. Coberly, inventor of the Kobe hydraulic pumping process and founder of the company.

H. Zinder & Associates Inc., utility consulting firm of Washington, D. C., and Dallas, has opened a new branch office in Houston. The new office, under the direction of Dr. Ionel I. Gardescu, well known in the petroleum field since 1920, will provide consulting services in the field of gas and oil reserve estimates and related subjects for producers, pipeline companies, and financial institutions. This will supplement the firm's present services, which include utility rate, cost studies, and marketing consultation.

Construction has begun on Jones & Laughlin Steel Corp.'s new research center in Pittsburgh. The center, to cost initially more than $1.5 million, will consist of several buildings housing a research staff of about 100.

West Kentucky Natural Gas Co., Owensboro, has applied to the PSC for authority to transfer 3709 shares of its common stock in exchange for all the outstanding stock of Shelbyville Gas Co.

Niagara Power Corp. has received New York PSC authorization to supply natural gas to an additional 24,700 space heating customers. The PSC allocated 8500 installations in the Syracuse-Oswego division, 4050 in the Utica-Rome division, and 12,150 in the company's eastern division.

Pittsfield Coal Gas Co. has told the state department of public utilities in Massachusetts that it has completed arrangements to finance the purchase of the Berkshire Gas Co., a New England Electric System subsidiary. Agreement on the Berkshire sale at a price of $662,500 was announced last February.

The Southwest Air Conditioning Supply Co., a newly formed organization headquartering in Beverly Hills, Calif., has been named a California distriubtor for Rheem Manufacturing Co.'s heating and air-conditioning line and built-in appliances.

For the second time in its history, Citizens Gas & Coke Utility's distribution department has completed 1 million man hours of work without a lost-time accident. Approximately 500 employees of the Indianapolis, Ind., company compiled the second million man hours over a period of about two years.

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STANDARD OF EXCELLENCE IN Gas UNIT HEATERS

A new concept in Unit Heaters — *new* inside and out. Stimulating styling that sells . . . plus more engineering achievements that surpass all others. Efficiency and rugged construction for the toughest heating task. Top flight quality to suit even the most conservative buyer has established the name —Peerless—that has been counted on for dependability for 70 years.

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President

P. W. Geldard
Vice President

Need for sound PR voiced during Canadian meeting

The basic need for sound public relations was emphasized by A. E. Grauer, president of British Columbia Electric Co. Ltd., when he addressed delegates to the recent convention of the Canadian Gas Association held in Banff. Each company in an industry "must tell its story and keep telling it as intelligently as possible," se said.

But what is true of any business is even doubly true of a public utility, he said. Serving as it does all or most people in an area, having a monopolistic position, and being under government regulation; "being a target for left-wing groups and having a fascination for the newspapers, we are very much on the battlefront. If we don't take care of ourselves, nobody else will for us."

S. B. Severson, chairman of the board of Dominion Natural Gas Co. Ltd., Buffalo, N. Y., was elected president, succeeding D. K. Yorath of Edmonton. P. W. Geldard, Consumers' Gas Co. of Toronto, became first vice president and F. R. Palin, Union Gas Co. of Canada Ltd., Chatham, is the new second vice president.

AGA's 1954-1955 nominees named by committee

Top executives from gas utility, pipeline, and manufacturer company members throughout the United States and Canada have been nominated as general officers, directors, and section officers for the 1954-1955 association year by the general nominating committee of the AGA.

F. M. Banks (left) is up for president and Dean Mitchell (right) is up for 1st vice president.

Manufactured under Consolidated Edison Co. of N. Y., Inc. Patent No. 2,342,045. Application development assistance by Public Service Electric and Gas Company of New Jersey

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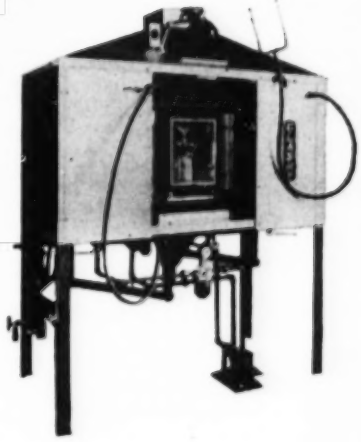

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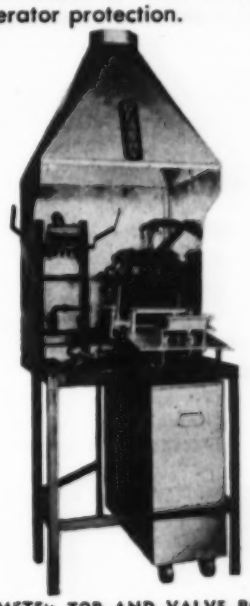
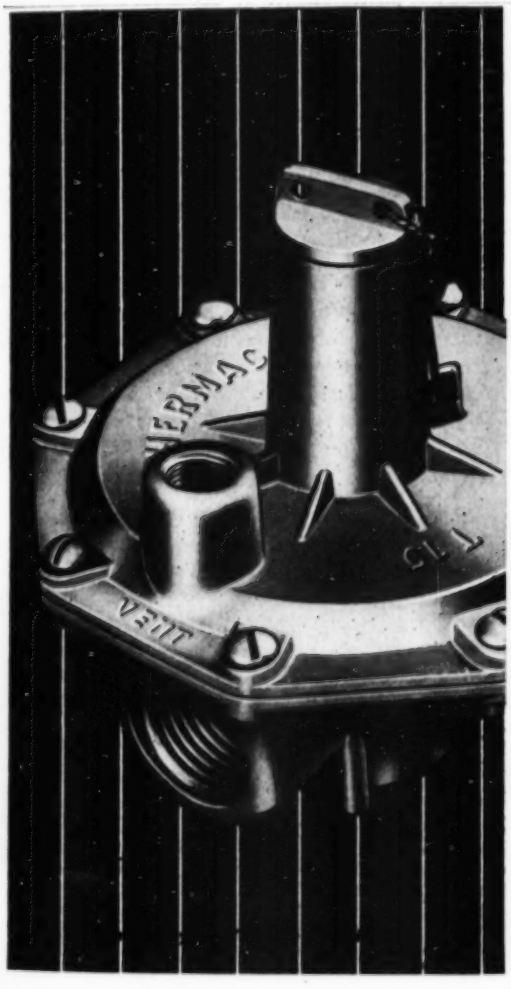


METER TOP AND VALVE BOX COVER REMOVING MACHINE



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Nominees will be voted upon by the membership at the 1954 annual convention in Atlantic City, Oct. 11-13. Offices to be filled include those of president, two vice presidents, treasurer, 15 directors, and 11 section chairmen and vice chairmen. Nominated to serve as president is F. M. Banks, president and general manager of Southern California Gas Co., Los Angeles. Dean H. Mitchell, Northern Indiana Public Service Co., Hammond, is up for 1st vice president; C. H. Zachry, Southern Union Gas Co., second vice president; and Vincent T. Miles, Long Island Lighting Co., Mineola, treasurer.

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Section chairmen and vice chairmen:

Accounting—A. T. Gardner, Delaware Power, and E. R. Eberle, Public Service Electric & Gas. General management—Larry Shomaker, Northern Natural Gas Co., Omaha, and John J. Carson, East Ohio Gas Co., Cleveland. Industrial and commercial gas—Ray Trowbridge, Seattle Gas, and Lawrence E. Biemiller, Consolidated Gas, Electric Light & Power Co., Baltimore. Operating—Walter H. Davidson, Transcontinental Gas Pipe Line Corp., Houston; J. H. Collins Sr., New Orleans (La.) Public Service Inc.; and Fred A. Hough, Southern Counties Gas Co., Los Angeles (second vice chairman). Residential gas — Walter H. Kurdelski, Michigan Consolidated Gas Co., Grand Rapids, and B. H. Wittman, Peoples Gas Light.

Aggressive promotion needed for lagging sales

Aggressive, solid-punching sales promotion is needed to win the fight for the gas industry, the 150 delegates to the recent New York-New Jersey regional gas sales conference were told. Sponsored by the residential gas section of the AGA, the meeting brought out many constructive suggestions to bolster lagging sales. Strong support was urged for the PAR and GID programs.

John B. Frost, Brooklyn Union Gas Co.,

Regional sales conference chairman John B. Frost, left, and James F. Oates Jr. chat during pause in program.

On the program at the regional sales conference were (from left) Christy Payne Jr., Hugh L. Wathen, and Henry Rohrs, who is the newly elected chairman of the New York-New Jersey regional gas sales council.

chairman of the conference, urged more promotional support for dealers, who make 85% of all gas appliance sales. James F. Oates Jr., Peoples Gas Light & Coke Co., stressed the need for more action and less talk.

A bright star on the horizon, Mr. Oates said, is the trend of all segments of the industry toward increased cooperation and better understanding of their interdependence. He pointed to such industry organizations as AGA, INGAA, and GAMA and the coordination of their efforts to increase sales and promote public understanding.

The delegates were told that television is the weak link in the gas industry merchandising program by Arthur B. Modell of L. H. Hartman Co. Inc. He said that even in the broadest sense the gas industry "is only dabbling in television," and recommended that the industry sponsor a national network television program.

A list of do's and don'ts for building adequate househeating sales volume was offered by Willard C. Wolfe of Bryant Heater di vision. On the negative side, he cautioned companies not to give up good service and not to sell "cheap" equipment. His constructive suggestions included: get a sound rate structure; sell management, provide adequate salesmen's compensation, offer a budget payment plan to customers, and go after the new-home market.

Following a report on the test-city program by Christy Payne Jr., Peoples Natural Gas Co., Hugh L. Wathen, South Jersey Gas Co., presented a vigorous plea for gas refrigerator merchandising support.

Only fast recovery automatic gas water heaters are able to provide sufficient high temperature water for maximum effectiveness of automatic washing machines, according to Frank A. McFerran of Ruud Manufacturing Co. In a dual presentation with Mr. McFerran, Miss Dorothy Shank, associate editor of *What's New In Home Economics*, spoke on the education of the American home-maker.

W. L. Hayes, Montana-Dakota Utilities Co., Minneapolis, brought the meeting to a close with a plea for the gas companies to get back into good old-fashioned door-to-

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MAKING THE GAS INDUSTRY SAFER

door selling. During the past 10 years, he declared, with few exceptions the dealer has had the merchandising to himself. The result, he continued, is that the gas industry has lost ground because the sales of gas appliances are of secondary importance to them.

First PR conference backed by five groups

Five national and regional associations combined recently to hold a pioneer event: the first joint regional conference on gas industry public relations. The all-day meeting in Boston presented high spots of the public relations plans of the AGA, GAMA, and INGAA. Co-sponsors with these groups were NEGA and the Liquefied Petroleum Gas Association of New England.

Staged as a pilot-plant operation, the conference will be followed by similar regional meetings throughout the country. On July 26 such a conference was held in Omaha.

An audience of more than 105 gas company presidents, PR directors, sales managers, division managers, and superintendents heard NEGA President Roy E. Wright hail the meeting as a "striking development in association cooperation."

"Supporting your industry's public relations program with your pocketbook is essential," declared Virgil L. Rankin, management public relations consultant, "but the real support is your own personal implementation of the program locally."

Remick McDowell, Peoples Gas Light & Coke Co. and chairman of the AGA PR coordinating subcommittee, reported that the association's recent survey of member companies revealed that organized PR activities are lacking in many companies, particularly in smaller ones.

Regional conferences such as the Boston meeting are expected to help gas companies organize and strengthen their public relations activities, Mr. McDowell said. The AGA has initiated a special exchange of successful public relations ideas and techniques and will greatly expand its flow of basic gas industry information to members. In addition, the AGA has started the first newsletter, "Intercom," devoted specifically to public relations in the gas industry.

"GAMA Public Relations—in Action!" was described by Eugene F. Martin, vice president of Carl Byoir & Associates. GAMA's PR program has accomplished three things: (1) It has moved the gas business into the national foreground; (2) it has delivered a message of product and fuel superiority to all important segments of the public with increasing force; and (3) it has helped consolidate the industry's brain power, production capacity, and leadership.

W. E. Wilson, United Gas Corp. and chairman of the INGAA public information advisory committee, noted that the INGAA program has provided a set of valuable signposts for use by all segments of the gas industry. Guiding principle, he said, is that no public relations program can be successful unless it is in the public interest.

Legal authorities address five-day symposium

Delegates to the recent five-day symposium jointly sponsored by the AGA and the Practicing Law Institute received first-hand opinions on the Phillips decision of the U. S. Supreme Court on the day the decision was handed down from such authorities as Nelson Lee Smith, FPC, and W. E. Torkelson, chief counsel of the Wisconsin Public Service Commission.

The New York seminar attracted more than 250 participants representing federal and state legal counsel, production, transmission and distribution companies, accountants, allied trade associations and other interested groups. Current legal problems of the gas pipeline and distribution companies were analyzed and discussed by the experts in attendance.

Speakers at the session on appliance uniformity at the research and utilization conference were (from left): R. W. Ramsdell, East Ohio Gas; William Marshall, Minneapolis Gas; J. J. McKearin, Laclede Gas; A. J. Cassidy, Rheem Manufacturing; and William Day, Perfection Stove.

Basic advantages of gas should be utilized

Anything competition may offer against the inherent advantages of gas for cooking is relatively inconsequential. The fundamental problem of the gas industry is not matching the few and minor advantages of a competitive range but that of incorporating in practice the many and basic advantages of gas ranges.

This challenging statement was made by Leon Ourusoff, Washington (D. C.) Gas Light Co. at the ninth annual research and utilization conference held in Cleveland recently. He told the 400 delegates in attendance that more intensive research in laboratories and prompt industry response to findings achieved through such research can bring about a renaissance in the markets for domestic gas. He outlined the present competitive position of gas appliances and spoke in detail on gas ranges and air conditioning.

Mr. Ourusoff blamed the lag between theory and practice in gas range design on a lackadaisical attitude by some sections of the industry. He said the gas industry is not getting its share of the air conditioning load, and recommended that the industry concentrate on the promotion of residential absorption units. The industry should initiate without delay the long-range development of other applications of gas to air conditioning based on the findings derived from current studies and surveys, he said.

Air conditioning research occupied a prominent spot in the conference. R. J. McCrory, Battelle Memorial Institute, reported on the present investigation under the PAR research program.

PCGA men to meet for 61st annual convention

Plans are shaping up for the 61st annual convention of the Pacific Coast Gas Association, scheduled for Sept. 8-10 in Vancouver, B. C.

Under the direction of A. E. Grauer, British Columbia Electric Co., the program committee has lined up such speakers as AGA President Earl H. Eacker, whose talk is entitled "Do We or Don't We?" and GAMA President Sheldon Coleman, who will speak on "Inventory for Action."

Other general session speakers include Raymond W. White, Pacific Gas & Electric, on liability insurance problems; W. P. Woods, Conversions & Surveys Inc., on problems of changing from manufactured to natural gas; Remick McDowell, Peoples Gas Light & Coke Co., on "The Public—Your Barometer of Success"; and Milford Springer, of Southern Counties Gas Co., on "A Fair Return for a Natural Gas Utility." In addition, the Honorable W. A. C. Bennett, premier of British Columbia, and the Honorable R. H. Winters, Minister of Public Works, will address PCGA delegates.

GAS Transmission and Conditioning Section

Pacific hopes to introduce natural gas by '55

Pointing to the future through the pipe is Ray C. Fish, chairman of the board of Pacific Northwest. Seated is Alfred Glassell Jr. Standing from left are J. R. Imber, treasurer; Robert R. Herring, vice president, and Leon Payne (right), director.

NATURAL gas was never more eagerly awaited anywhere in the United States than it is today in the Pacific Northwest, the only major region of the country that does not now have a supply.

It has been promised for late 1955 after more than six long years of tortuous planning, heated controversy and almost two years of hearings before the Federal Power Commission.

Recently the FPC authorized Pacific Northwest Pipeline Corp. to bring a supply from the San Juan basin of New Mexico through a transmission line 1466 miles long, costing about $160 million. At the same time a competing application by Westcoast Transmission Co., proposing to bring natural gas from the Peace river region of northern British Columbia and Alberta was denied.

"When?" was the first question asked of C. R. Williams, Houston, president of Pacific Northwest Pipeline, when the FPC announced its decision. He said he hoped gas could be delivered by late 1955. Six or more construction spreads will be used to do the job.

However, before construction can begin, financing for the line must be completed and essential to financing is firm contracts with the Northwest's distributors who have been treading water with manufactured gas for many years in a market dominated by fuel oil.

Robert R. Herring, youthful vice president of Pacific, who will be in charge of marketing, has been touring the region in recent weeks negotiating those contracts with distributors. Then financing, which is expected to take from 60 to 90 days, can begin.

The distributors and civic planning groups predict an era of rapid industrial development to be ushered in by natural gas.

Continued on page 120

J&L pipe and progress

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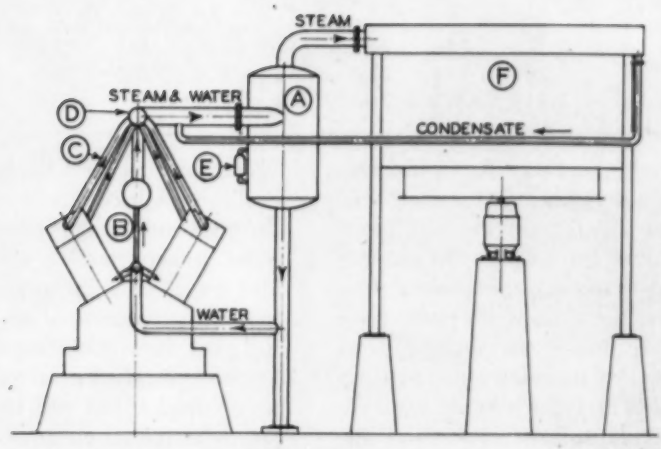
Cooling in the elevated range, at non-condensing temperatures above the dew point of combustion gases, eliminates condensation in the cylinders and prevents acid formation. Advantages of the system, well known for a number of years, are now being incorporated into cooling systems for gas compressor engines. A typical vapor-phase cooling hook-up is shown at right. (Fig. 1. See page 92 for flow details.)



How large gas compressors utilize vapor phase engine cooling

By L. C. HARBERT, President • Engineering Controls Inc., Los Angeles

LARGE gas engine-driven compressors and generators are now being cooled at elevated jacket water temperatures, in the boiling range, by vapor phase—many without pumps, using natural or thermal circulation. One such installation, described later, cools at boiling, five 880-bhp engines now operating in the Agua Dulce, Texas, compressor station of the United Gas Pipe Line Co.

Where the engine waste heat can be used, the system produces the heat in its most useful form—low pressure steam. Many systems now operate at up to 25 psig and with slight alteration, most modern engines can be operated at pressures of 50 lb or more.

We first applied this method of cooling in 1939 to oil well pumping engines, using forced circulation. During the recent war we developed thermal circulation making some 2000 applications to military engines and have since equipped hundreds of engines of various types and sizes with this improved system.

The water is circulated without intentional cooling and eventually boils, making steam, which is separated in the vapor phase unit and passes to a cooler where it is condensed, thereby cooling in the vapor phase—hence the name "vapor phase" engine cooling. When the water pump is removed circulation is accomplished by thermal energy, this being natural or thermal circulation. The vapor phase unit contains a steam separator, built in at the top, and a sedimentation chamber in the bottom where all solids are collected for blowdown.

Engineers for years have known the value of cooling in the elevated range at non-condensing temperatures, above the dew point of the combustion gases, which eliminates condensing of the water of the products of combustion within the cylinders and prevents acid formation, which accelerates cylinder wear and causes sludge formation in the lubricating oil.

The literature is abundant in its coverage of cooling at elevated temperatures dating back as far as 1916. In the period from 1916 to 1936 much work was done by Muir, Rushmore and others on the cooling of automobile engines by the pressure and steam-cooling method. The patent files disclose more than 100 patents on these and other types of high temperature cooling.

In a paper by Herbert C. Harrison appearing in the *SAE Journal*, about 1925, he describes a system built by his company, The Harrison Radiator Corp. of Lockport, N. Y., called evaporative cooling. This system had been developed over a period of seven years by applying it to several specially designed cars plus several hundred other cars using various kinds of condensing radiators. In this test, cars were operated over more than 500,000 miles. While tests included operating at various controlled pressures to raise or lower the boiling point of the coolant, the control utilizing atmospheric pressure was found to be simplest and most suitable for temperature control. Such systems are described in Mr. Harrison's paper as satisfactory in operation and beneficial to engine performance and life.

Where control of temperature is at atmospheric pressure, all of these writers appear to agree on the following benefits:

1. Uniform coolant temperature at all speeds and loads, controlled by the natural law of boiling.
2. Faster warm up.
3. Increased mechanical efficiency resulting in greater mileage per gallon of fuel.
4. Reduced oil sludge.
5. Greatly reduced cylinder wear.

Since the benefits to be derived from cooling at elevated temperatures were proved years ago and are understood by engineers today, why then has the industry been so reluctant to adopt some of these old methods?

I believe the reason why these steam and evaporative cooling systems were

TABLE 1. METAL AND WATER TEMPERATURE

% of Load	Run No.	Thermocouples in Metal								Thermocouples in Water						
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
92	4	220	218	220	218	215	221	222	221	218	218	218	214	214	212	214
106	6	217	214	220	215	214	220	222	220	218	215	218	212	212	213	213
115	10	219	217	220	218	212	220	222	222	217	217	217	213	212	212	213

not generally used was due to mechanical troubles experienced rather than functional failures. In the first place, the matter of space under the automobile hood is limited, the systems were bulky, and the condensate pump gave trouble because of the variable flows which resulted from the rapidly changing speed of cars. Fortunately, my company selected only stationary and marine engines, not automobile, for its systems, thus avoiding many mechanical problems inherent with automotive equipment.

During the past 15 years our systems have been sold to cool engines aggregating more than 250,000 hp. While the results in general have been good, many mechanical problems have had to be solved, particularly when thermal circulation is involved, as this calls for careful consideration of water passages within the engine and the piping to and from the vapor phase unit.

The field of cooling is so varied, because of the many different types of engines and their wide range of service, that we are constantly confronted with new problems; however, I believe the system, when properly engineered and applied, has very few limitations.

Thermal circulation

By thermal circulation, engine heat is removed by the latent heat of vaporization, whereas in liquid phase cooling the heat is removed to a large degree as sensible heat.

Fig. 1 shows the system connected to the power cylinders of a large gas engine-driven compressor. Two circuits are employed. The primary circuit, being the coolant, flows out of the vapor phase unit "A" through the engine jackets and back, repeating the cycle. When the engine is first started up, and until it has run for several minutes, there will be no movement of the coolant. When sufficient heat has been rejected, ebullition will commence in the cylinder head and the upper part of the cylinder jacket, starting circulation. As load is applied, circulation will increase, in direct proportion to the load. Under full load, some ebullition will occur, as low in the cylinder as the end of the piston stroke, and will increase in intensity as the water, carried along with the steam, passes upward around the combustion chamber and the water-cooled exhaust manifold, much the same as it does in a water tube boiler or a pan of boiling water when the flame is turned up.

The water and steam enters the vapor phase unit tangentially, causing it to swirl around inside. Any scale or foreign matter in the coolant is thus thrown down in the mud drum built in at the bottom of the unit, where baffles arrest the swirl and trap the solids, which are then drawn off by blowdown.

The steam separator, built in at the top of the unit "A", dries the steam, which passes through the secondary circuit, which is a steam condensing coil in Unit F. This unit also contains a water coil for lube oil cooling. The steam condensate returns to the primary circuit at the point shown. The condensate may at times be sub-cooled; therefore, it is desirable to have it enter as near "D" as possible so it will be heated to boiling before it enters Unit "A".

Piping for thermal circulation

As considerable steam will form in the engine jackets, somewhat larger outlet lines are required. It is imperative that the system be so piped as to insure the inlet leg, containing solid water, being heavier than the outlet leg of water and steam, to insure a minimum of restriction. The inlet water header is tapped and a small line installed to carry water to the exhaust manifold "B". Usually, though not always, an auxiliary line "C" is required to pass all water and steam out of the cylinder and head. An additional pipe manifold "D" is installed above manifold "B", where the auxiliary line "C" and the one supplied with the engine are tied in. By separating the flow through the exhaust manifold "B" from the jackets, a free flow through all parts is obtained.

Unit "A" is mounted low, the bottom of the unit being even with the top of the water jacket. The low water switch "E" is positioned so that when the water level in the unit falls to unsafe level, the engine will be shut down while the jackets are still full of fluid.

Where the steam condenser can be mounted at the height shown and when the condensate header of the steam condenser is at least 24 in. above normal liquid level in Unit "A", condensate will flow back to the primary circuit by gravity. Unit "A" is normally supplied with a pressure relief valve, pressure gauge, air vent valve, gauge glass and an automatic fresh water make-up valve, in addition to the low water float switch.

Development of thermal circulation

Cooling by vapor phase using thermal circulation was first applied to engines in sizes up to 100 bhp and, while we recommend this method of circulation for larger engines, it was several years before the industry started to accept it. We were greatly assisted in its introduction by one of the engine manufacturers, by two government agencies, and by several of the engine owners and operators. O. B. Freeman of the Tide Water Associated Oil Co. at Ventura, Calif., became interested in 1951 when we loaned him the vapor

TABLE 2. ENGINE ROOM TEMPERATURE

Location of Thermometer	Temperature, F
Ambient air	84°
6 in. from power cylinder 30 in. above floor	97°
18 in. from power cylinder 30 in. above floor	96°
72 in. from power cylinder 30 in. above floor	95°

TABLE 3.

Percent of Engine Load	Steam-Water Ratio
25	90 lb of water to each pound of steam
50	50 lb of water to each pound of steam
75	27.5 lb of water to each pound of steam
100	18 lb of water to each pound of steam

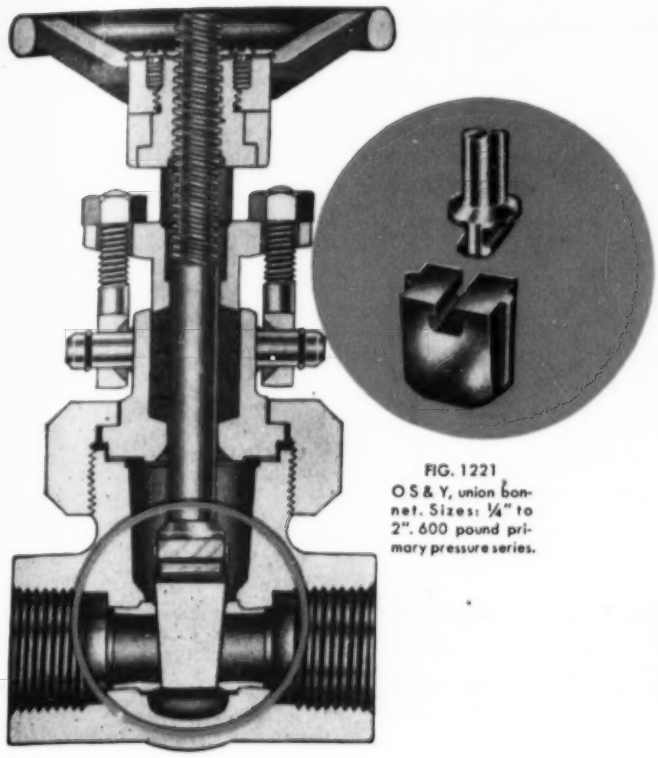


FIG. 1221
O S & Y, union bonnet. Sizes: ¼" to 2". 600 pound primary pressure series.

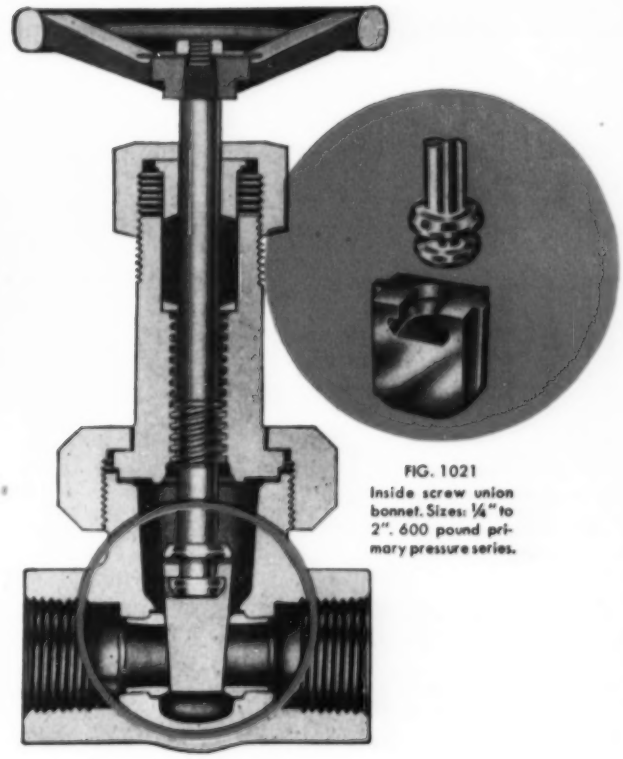


FIG. 1021
Inside screw union bonnet. Sizes: ¼" to 2". 600 pound primary pressure series.

New design makes OIC forged steel gate valves the most modern line . . .

NEW: stronger stem-to-wedge connection. Improved, modern design increases pull-out strength to many times the theoretical requirement. This design distributes the pull-out load more efficiently throughout the wedge structure to meet the most stringent specifications of valve buyers in all fields.

NEW: wedges wear longer. Wedges are made of 13% chrome stainless steel for corrosion resistance. They are duracased to at least 1000 Brinell Hardness to prevent galling and excessive wear caused by frequent closures upon foreign particles in the flow.

NEW: union bonnet design is more efficient. Body-to-bonnet joint of the male-female type provides a recess for the gasket. It is contained more securely, reducing the possibility of leakage or a blown gasket.

OTHER OUTSTANDING FEATURES

Stem threads of all OIC inside screw, forged steel valves are always contained inside the bonnet. They can't possibly load up with corrosive matter which might be in the flow. This keeps the threads clean and free running, and contributes to longer stem wear.

Modern OIC Seal-Ever packing is a special composition which eliminates electrolytic action between the stem and the packing. This prevents stem corrosion in the packing area and helps maintain a leakproof seal.

Back-seating feature provides means of repacking valves while in service.

OS & Y valve gland "I" bolts are retained on trunnions by modern, more efficient, stainless steel snap rings.

Shoulder-type seat rings are expanded into the body under heavy pressure. They are accurately machined to mate tightly with the wedge for a positive seal.

Order modern OIC Forged Steel Valves from your nearby OIC Distributor. Write and request Folder No. 195.

OIC Forged Steel Valves are also available in globes, angles and checks in a variety of trims for any service.

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OIC VALVES | **FORGED & CAST STEEL, LUBRICATED PLUG, BRONZE & IRON**

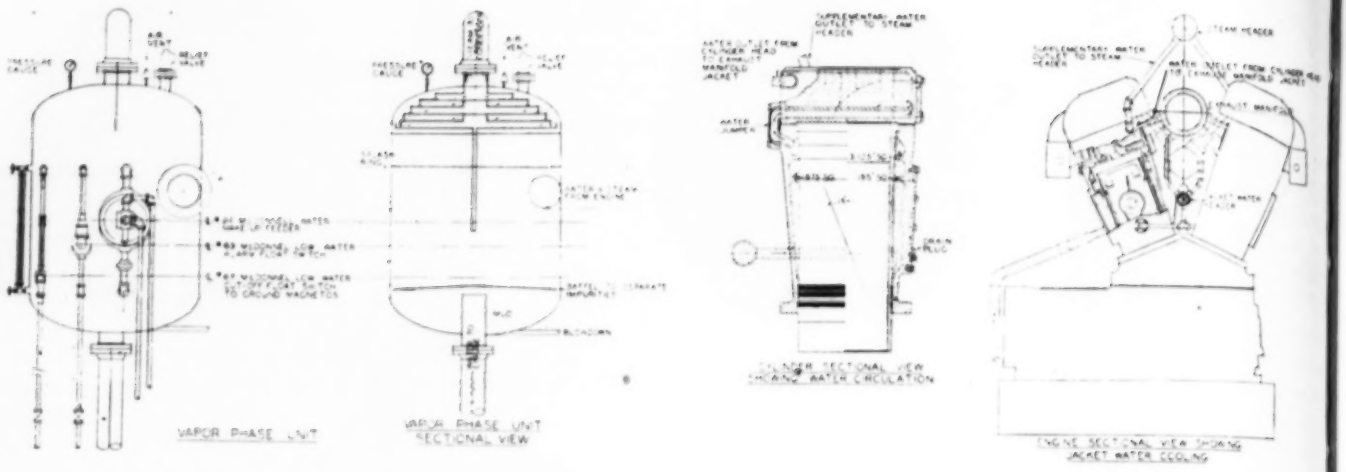

VAPOR PHASE UNIT
VAPOR PHASE UNIT SECTIONAL VIEW
CYLINDER SECTIONAL VIEW SHOWING WATER CIRCULATION
ENGINE SECTIONAL VIEW SHOWING JACKET WATER COOLING

Fig. 2 (above and right) shows details of the components of one of the five 880-bhp compressor units.

phase equipment for experimental use.* After exhaustive tests on small gas engines he became convinced of the merit of the method and made the first application on a gas engine-driven compressor of 150 bhp and later on several 300-bhp units. Since then many others have assisted us in perfecting the system by conducting tests to determine metal temperatures and temperature differences within the engines, so that the proper openings in the jackets and line sizes can be determined. One of these is the United Gas Pipe Line Co., whose installation, mentioned earlier in this article, is shown in *Figs. 2, 3,* and *4.*

Vapor phase equipment

In *Fig. 2,* one of the five 880-bhp compressor units is shown. Each has identical equipment consisting of a vapor phase unit with its accessories and controls, an aerial cooler with a steam coil for cooling the power cylinders, and a water coil for cooling of the lubricating oil. All five systems are interconnected with a steam equalizing line and a water surge header, which is used for heating idle engines.

Necessary enlargement of water passages and lines are shown in *Fig. 2.* The jacket water inlet header was tapped and water is fed into the bottom of the exhaust manifold at either end by two small pipes. Each cylinder head has one 1¼-in. line, supplied with the engine, and a supplementary 1½-in. line to carry the water and steam out of each cylinder. Above the water-cooled exhaust manifold a 6-in. header extends to the front cylinders where it is increased to 8-in. for passing the circulating water and steam to the vapor phase unit. This header is added at time of installation.

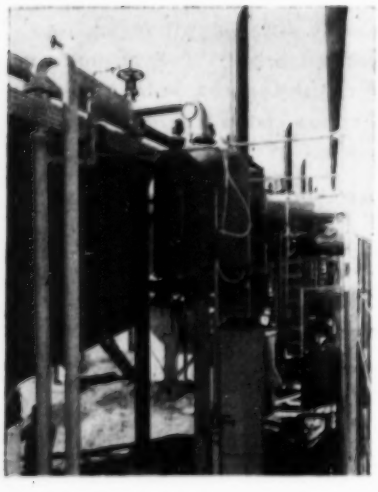
Metal and water temperatures

In order to determine the temperatures existing within the engine the United engineers sealed thermocouples in the cylinder metal and suspended others in the water jackets as shown in *Fig. 5.*

Two cylinders were used for these tests. Eight thermocouples (Nos. 1 to 8) were sealed in the metal and seven (Nos. 9 to 15) suspended in the water at the points shown in cylinder No. 3.

It was determined to alter this cylinder by lowering the 1½-in. supplementary water outlet to steam header from

*See "Ebullition Cooling" by Mr. Freeman in the April 1953 issue of *GAS.*



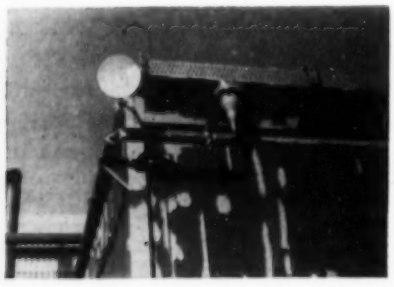


Fig. 3 (left). Vapor phase steam separator unit. Above is the condensate return to jacket water and steam header.

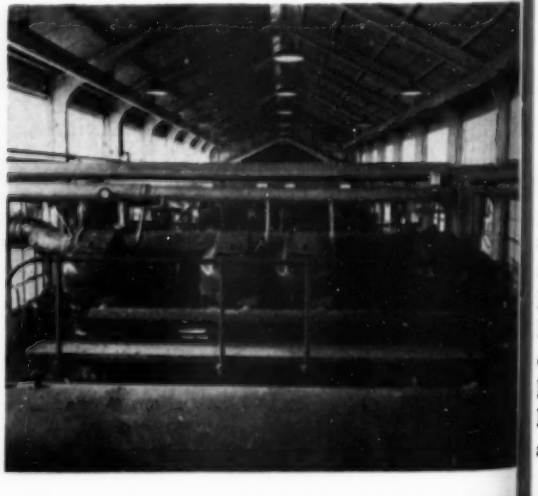
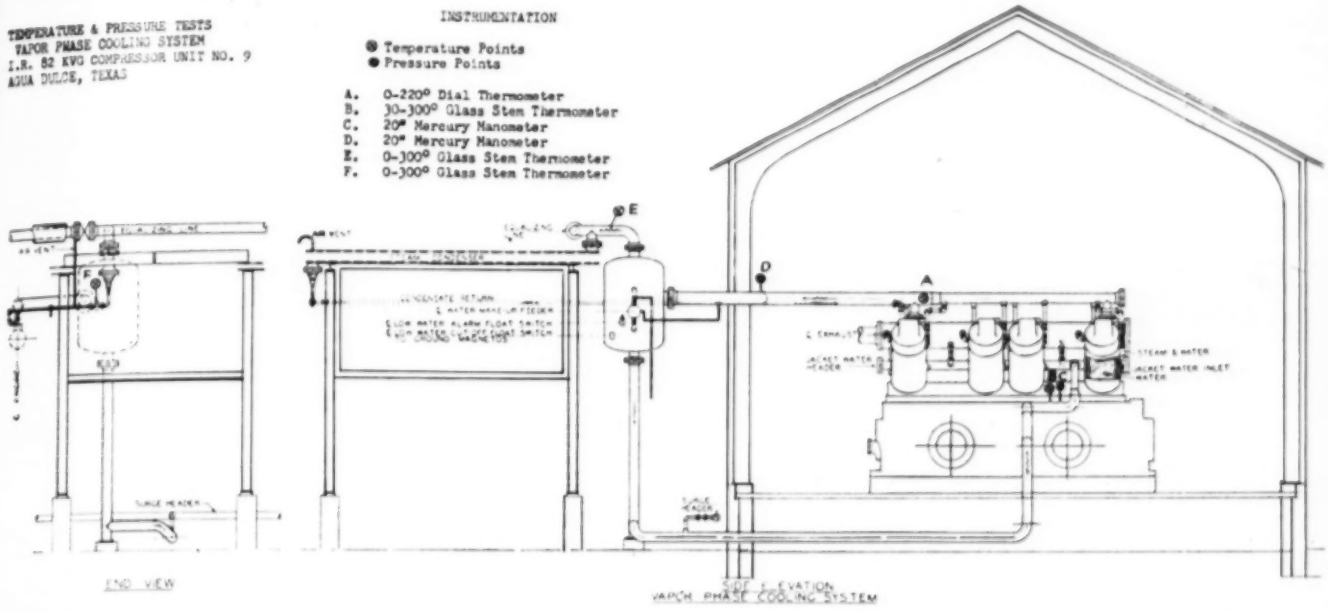


Fig. 4 (right). Engine room at Agua Dulce.

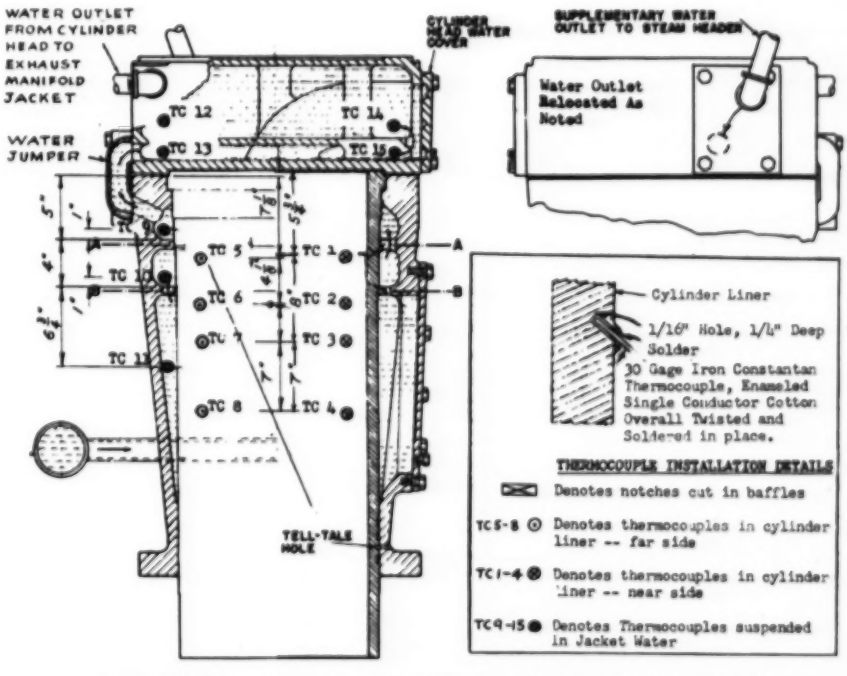


the top to the lower water and steam passage of the head and to provide additional passages for the water in the cylinder by cutting notches in the water baffles. Cylinder No. 7 was not altered in any way. It was proved by the tests that moving the 1½-in. pipe to the lower passage reduced the pressure in head No. 3 to substantially atmospheric pressure, or 212° F, whereas the thermocouples in the head of No. 7 showed 218° to 220° F, or about 2.5 psig. The thermocouples in the cylinders of both Nos. 3 and 7 showed about the same water and metal temperatures. However, the enlargement of the water passages in the baffles of No. 3 cylinder improved the flow and reduced the temperature at some thermocouples by about 20° F.

For a period of several days the test engine was operated at loads of 92, 106, and 115%. The readings in *Table 1* from the thermocouples in No. 3 cylinder show the metal and water temperature in degrees Fahrenheit.

Thermocouple was checked in boiling water and was off 1½° F + 1½° F to all thermocouple readings.

It will be noted that the greatest temperature difference between metal temperatures TC Nos. 1 to 8 inclusive as shown in test run No. 6 is only 8° F and in run No. 10 is only 10° F; No. 5 TC was believed to be reading low. The greatest temperature difference between the hottest metal and the hottest water in run No. 10 is only 10° F. The greatest temperature difference across the engine was 5° F. This can



CYLINDER LINER ASSEMBLY SHOWING BAFFLES AND WATER CIRCULATION

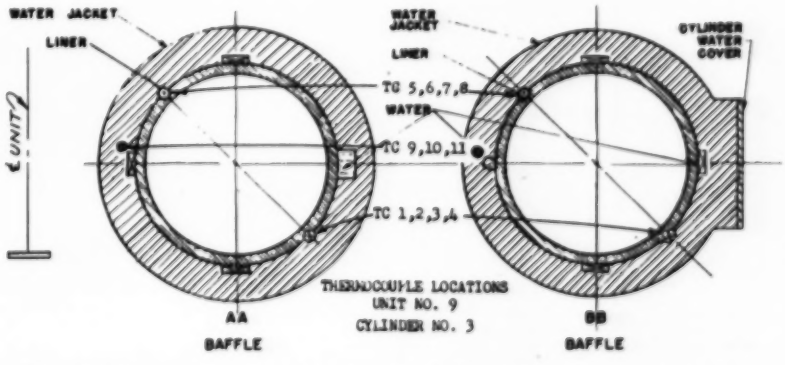


Fig. 5. Cylinder liner assembly showing baffles and water circulation.

be reduced to about 2° F by insulating the vapor phase unit and the inlet water line.

While assisting with the above tests, I recorded the temperatures shown in *Table 2.*

Make-up water

During the first week of operation at Agua Dulce each vapor phase unit was blown down several times to remove the dirt that had collected in the piping during installation. This blowdown water was not all wasted as it was piped back to the soft water supply tank where the solids settled out and the water was used again. In the vapor phase system the cooling water is never circulated through a cooler; only steam passes through it and the steam condensate (about 5 gpm, in this size engine) is the only water that comes into contact with the atmosphere. Very little water can, therefore, be evaporated and very little oxygen can be picked up by this amount of water to form rust in the engine jacket system. Soft make-up water should be used. However, some operators do not treat their water because practically no make-up water is used when all joints are maintained tight to prevent leaks.

Overloading and detonation

During the 115% loading of the test engine there was no detonation because the air cleaner is installed outside and the hot exhaust line, inside the building, is insulated. When operating in hot dry climates, intercoolers are usually required for both vapor phase and conventional cooling. A wide variety of gas and diesel engines, cooled by vapor phase, operate at times at loads of 10 to 15% above the manufacturer's rating without detonation.

Some engine manufacturers have derated their engines because of vapor phase on the theory the engine room would be very hot from radiated heat. However, these same engines operate at full rate and even at overloads beyond the manufacturer's rating.

Lube oil and lube oil cooling

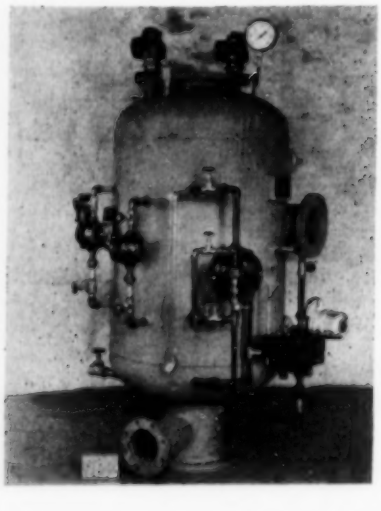
Where dry type pistons are used, lube oil cooling is not required with vapor phase. Where oil-cooled pistons are used, the lube oil must absorb about four to five times as much heat; therefore, it must be cooled.

High grade lube oils, of the straight mineral type, are adequate for all gas engines cooled by vapor phase. Since engines cooled by vapor phase are at temperatures above the dew point (194° F, minimum metal temperature), no condensing of the water from the products of combustion can be formed within the cylinders; thus acid formation is eliminated, because acid can form only in the presence of moisture, regardless of the amount of H_2S contained in the engine fuel. Thus sludging of the lube oil is eliminated.

The question of lubricating oil weight and temperature when using vapor phase is a controversial one and, in my opinion, is not well understood by many people. Some manufacturers and some operators believe SAE 40 and even heavier oil should be used and that additional cooling should be provided. As a matter of fact, many operators do not cool the oil in their dry piston type gas compressors and find that 190° F has resulted in no increase in maintenance, even when using SAE 20 oil and operating the units at full load with power cylinder jacket temperatures up to 260° F. Other operators of large compressor units in California have found that the oil temperature is lower when cooled by vapor phase thermal circulation. These engines have oil-cooled pistons and oil is cooled by a separate stream of water. One operator reports that some of the cooling water had to be passed around the oil cooler in order to maintain manufacturer's recommended minimum oil temperature. One reason for the cooler lube oil is the constant temperatures of the metal and water within the cylinder, resulting in even expansion of all metal from top to bottom of the cylinders, which reduces blow-by. Another reason is the increased rate of heat transference by the boiling water, which absorbs more heat.

Heating of idle engines

Where individual vapor units are desired for several engines in one station, so that each engine cooling system may be moved with the engine to another location, it will be necessary to install a steam equalizing line, connecting all vapor phase units at the top, and a water equalizing line, connecting all water inlet lines at the bottom. When so interconnected all idle engines are maintained warm, at about 200 to 210° F, with the steam from the operating engines. The steam flows down the individual engine outlet water-and-steam line, which contains no water when idle, and heats the water in the top of the engine by condensing the steam. As the condensate builds up, the heated water will flow slowly in reverse through the water equalizing lines to the other operating vapor phase units. By this method, the normal water level in both the operating and the idle units is maintained. Where one vapor phase unit is used to serve two or more engines, equalizing lines are not required.



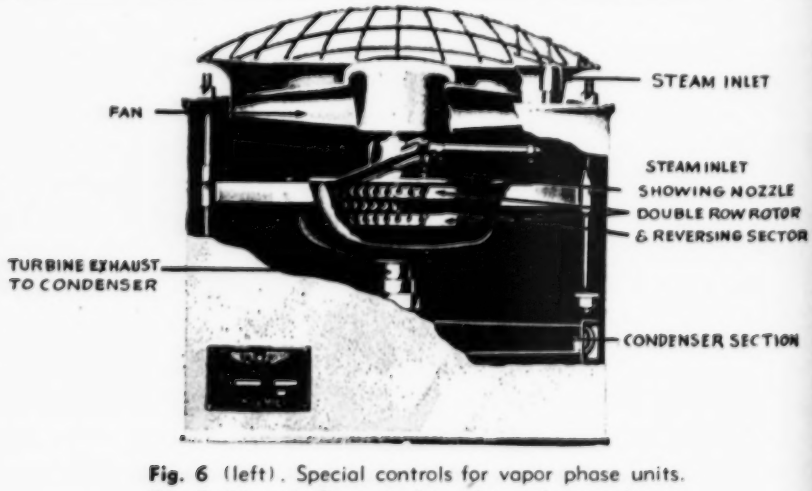


Fig. 6 (left). Special controls for vapor phase units.
Fig. 7 (above). Steam turbine-driven fan condenser.

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TABLE 4. HYPERION TEST

Results of load and steam test conducted July 17, 1951 on engine-generator No. 3 in the City of Los Angeles Hyperion activated sludge plant:

Test load	1714 bhp
Generator efficiency at 0.8 P. F.	947
Corrected for contract load: 1688 bhp	1193 kw
Fuel consumed: Sewer gas, 6230; pilot oil, 232; total, 6462 Btu/bhp/hr	
LHV of gas, 594 Btu/cu ft—LVH of oil, 18063 Btu/lb	
Steam production: Full load	3510/lb/hr
¾ load	2725/lb/hr
½ load	1950/lb/hr
Recorded data: Dry bulb, 81.5; wet bulb, 72; relative humidity, 66	
Water circulating rate	800 gpm
Water pressure at pump suction	25.3 psig
Water entering pump	239° F
Water out of engine and turbo charger	245° F
Water entering exhaust water heater	244° F
Water out of exhaust water heater	246° F
Steam pressure in vapor phase unit	10 psig
Exhaust gas out of turbo charger	730° F
Exhaust gas into exhaust water heater	703° F
Exhaust gas out of exhaust water heater	448° F
Exhaust gas into exhaust feed water heater	448° F
Exhaust gas out of exhaust feed water heater	328° F
Exhaust back pressure A.T.T.C. H_2O	9¼ in.
Feed water in	75° F
Feed water out	247° F

TABLE 5. HYPERION HEAT BALANCE—VAPOR PHASE COOLED DUAL-FUEL ENGINE

(Data taken from test results shown in Table 4)

Contract load	1688	bhp
Fuel consumed	6230	Btu/bhp/hr sludge gas
	232	Btu/bhp/hr diesel oil
Total	6462	

Total Btu input 6462 × 1688 : 10,907,856

Heat Balance	Btu's	Percent
Work—2545 Btu/bhp/hr × 1688	4,295,960	39.38
Steam—3510 lb/hr X 952.5 Btu/lb	3,343,275	30.65
Lube oil heat	600,000	5.50
Overall thermal efficiency	8,239,235	75.53
Stack loss	1,280,444	11.74
Radiation and other losses	1,388,177	12.73
	10,907,856	100.00

TABLE 6. INSPECTION MEASUREMENTS OF 11-IN. BORE CYLINDERS

Cylinder		Top ¾ In.	Middle 5 In.	Bottom 10 In.
No. 1	A*	11.011	11.0015	11.002
	B*	11.001	11.000	11.000
No. 3	A	11.00025	10.99925	11.000
	B	11.0005	10.999	11.000
No. 3	A	11.001	11.000	11.000
	B	11.001	11.000	11.000
No. 6	A	11.001	11.00075	11.001
	B	11.003	11.00475	11.007

* "A" is parallel to crankshaft. "B" is at right angles to crankshaft.

For large engines, individual vapor phase units are desirable because the size of a central vapor phase unit needed to serve two or more engines becomes quite large and the inlet and outlet header lines must be increased in size.

Circulating rates

The rate of water circulated in a vapor phase thermal circulation system is essentially the same as that of a water tube boiler and is approximately as shown in *Table 3*.

The amount of steam generated in the engine depends upon its type, size and load. A naturally aspirated, four-cycle gas engine requiring 10,000 Btu input per bhp will produce about 3 lb of steam per bhp per hour. The rate required at full load to cool a 1000-bhp engine of this type will be about 3 lb steam per bhp per hour or 3000 lb of steam per hour × 18 lb of water to 1 lb steam = 54,000 lb water per hour or 108 gpm. This represents 0.108 gpm of water per bhp. In order to cool the same engine in the liquid phase, 600 gpm of water would be required to obtain a 10° temperature rise across the engine, because each pound of water circulated will absorb only one Btu per pound per degree temperature rise, whereas in thermal circulation only a small percentage of the heat is removed as sensible heat, the greatest portion being absorbed by the coolant as latent heat. This means much smaller and less expensive lines. While the outlet water and steam line running to the vapor phase unit is larger than required for conventional cooling, the inlet line from the unit to the engine can be much smaller. The steam line from the vapor phase unit to the steam condenser for a 1000-bhp gas engine will require an 8-in. line and the steam condensate, being only 6 gpm, will require a 1½-in. line.

Fuels

In some oil refineries, natural gasoline plants, and petrochemical plants, considerable fuel is available that contains H_2S. Such fuels, if the H_2S content is high, are mixed with sweet gas and burned. This fuel can be used safely with vapor phase without causing accelerated engine wear because this gas cannot cause acid formation when cooling at the elevated temperatures. Many vapor phase-cooled engines have operated for years with untreated sewage sludge gas, oil field and refinery

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Field welding 12¾" Electric Resistance Weld Line Pipe near Bartlesville, Okla.

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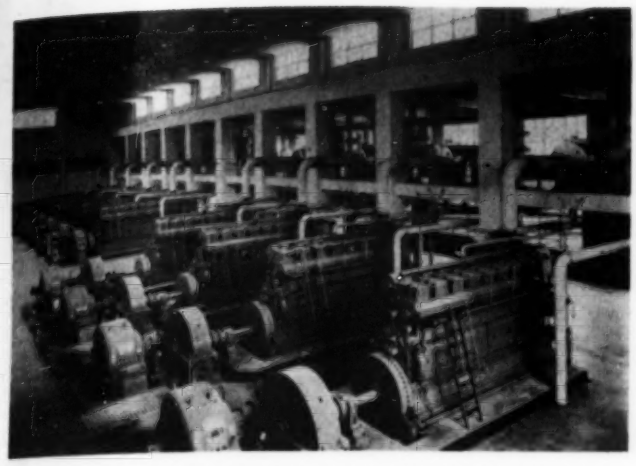

Fig. 9. Power and blower engine units at Hyperion.

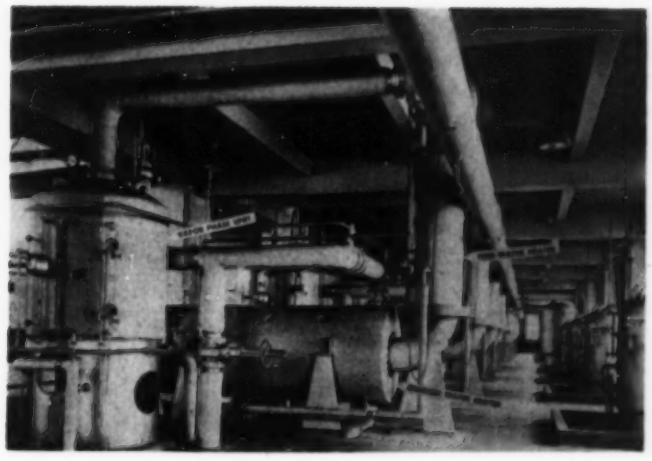

Fig. 10. Engine cooling and waste heat recovery equipment.

sour gas, all containing a high percentage of H_2S. Also diesel engines, operating on fuel oils containing as much as 3% sulfur.

Special controls

Fig. 6 shows a unit designed for unattended engines and where a condensate return unit may be required because the steam is being used in a heating system that is below the vapor phase unit.

The highest float switch, shown at the left, controls the condensate pump. The next lower one controls a standby condensate pump. The next one is the automatic fresh water make-up float valve. In case of failure of both condensate pumps and, at the same time, failure of the fresh water supply, the next float switch will sound an alarm or actuate a signal in the office upon lowering water level. If the cause of failure of the condensate pumps and fresh water supply is not corrected, the float switch, located below the alarm switch, will ground all engine magnetos, thus stopping the engine.

Steam turbine-driven fans

Several years ago we conceived the idea of utilizing the vapor phase steam to drive fans with turbines, thereby cooling engines with their own waste heat.

Shown in *Fig. 7* is the turbine unit which is complete with fan and finned coil for condensing the steam. The turbine will automatically start turning the fan as soon as steam is produced. As engine load increases the turbine speeds up, always supplying the correct quantity of cooling air for all engine loadings. When the engine is shut down the turbine does not stop until all residual steam is condensed. Larger size turbines are used to condense the steam and cool water to cool lubricating oil in large engines.

Engine jackets and liner sealing rings

Wherever rubber is used it should be replaced with a good plastic material such as silicone, and when new engines to be vapor phase cooled are ordered it should be specified that all gaskets and seals should be capable of withstanding the elevated temperatures desired. There are on the market materials that will withstand temperatures as high as 500° F. In one large plant where 17,000 bhp of gas engines are being operated with a jacket temperature of 250° F all rubber seals have been replaced with silicone and no leaks have been reported in 18 months.

Research and experience

During the past 15 years we have applied vapor phase to various sizes and types of American-built engines up to 3000 bhp and to six different types and sizes of foreign-built engines. Our systems are in operation all over the world and they include such installations as the Hyperion sewage treatment plant at Los Angeles where 10 1700-dual fuel engines have been in operation since 1950; the City of San Diego plant with six 300-hp gas engines; and several makes and sizes of gas compressors operating in refineries, gasoline plants and compressor stations, some of which have been in operation for more than five years. The United States Information Agency, Voice of America program, has during the past four years purchased and equipped over 40,000 bhp of engines with vapor phase systems for both cooling and waste heat recovery.

In our early research work, we were ably assisted by such people as the

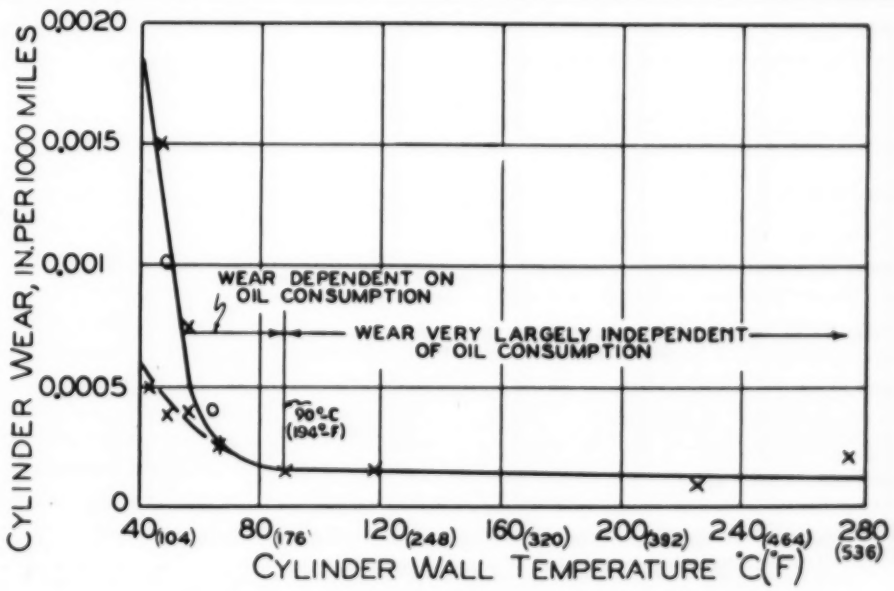

Fig. 8. Cylinder wear in relation to wall temperature.

Mr. Harbert, who has early experiences as a field engineer with Kansas Nautral Gas Co., Cosden Oil & Gas Co., and Oklahoma Natural Gas Co., formed a partnership in 1931 to engineer and install gas and diesel engine power plants. From this partnership Engineering Controls Inc. was formed. For the past 15 years, this company has engineered and developed vapor phase cooling systems for internal combustion engines.

Southern Counties Gas Co. of Los Angeles, which conducted comprehensive tests on a gas engine to determine input fuel rates, lubrication and waste heat recovery. One of the utility's engineers, Manly H. Clark, gave a paper* on one of our systems showing an overall engine thermal efficiency of 76% and a reduction of 15% in the input fuel. This was a 50-bhp horizontal gas engine. The United States Signal Corps conducted tests on two identical gasoline engines at Ft. Monmouth, New Jersey Signal Laboratories. Both engines were operated 600 hours at full load, one with conventional and one with vapor phase cooling. The vapor phase-cooled engine consumed 15% less fuel than the conventionally cooled engine. The City of Los Angeles conducted tests on one of their 1700-bhp dual fuel engines illustrated in *Figs. 9* and *10*. The result of the test is shown in *Tables 4* and *5*. Nine of the engines have operated for more than 20,000 hours with a maximum cylinder wear of .005 in. Lube oil consumption averages 7500 hp hours per gallon.

In our plant at Los Angeles we have operated gas and diesel engines for long periods of time with steam pressures up to 35 psig and in hot room temperatures up to 140° F. This and the work done by others over the years has proven that modern as well as very old style engines can be operated safely at elevated temperatures up to 280° F.

Corrosion

Cylinder wear is greatly reduced when engines are operated at elevated jacket temperature, above the dew point, as shown in *Fig. 8*. This chart is taken from the book, "Collected Researches on Cylinder Wear" by Williams, published in England in 1940 by the British Institute of Automotive Engineers. In fact, the rate of wear caused by corrosion is shown to be almost nil when wall temperatures of 194° F and higher are maintained, but below the dew point a rapid increase in the rate of wear occurs. This phenonema works to the advantage of vapor phase cooling and is borne out by the typical field results shown in *Table 6*. These inspection data were taken on four of six cylinders of an 11-in. bore, 225-bhp gas compressor in an oil refinery after 5800 hours of operation. Futher, it was observed that the pistons and combustion chambers were unusually clean. Adjustments and maintenance time for this and two other compressors cooled by vapor phase average 30% less than the average unit time spent on all other compressor units in this plant that are equipped with low temperature cooling systems, according to a report made by the plant master mechanic.

Waste heat recovery

The amount of heat recoverable from the jackets of a modern gas engine-driven compressor is in the order of 2500 Btu per bhp per hour. From older style gas compressor units as much as 3000 Btu per bhp per hour is recovered. This heat, in the form of steam, at 20 psig (258.8° F) is being used in two gas compressor plants in California to treat crude oil. The heat is recovered from one 150 bhp and three 300-bhp gas engines in one station and from one 150 bhp and seven 300-bhp gas engines in the other.

A temperature control valve, installed in the heated oil outlet line, operates a motor valve to regulate the flow of steam. When the steam pressure builds up to 22 psig the back pressure valve leading to a standby steam turbine-driven fan condenser opens and passes the steam to the turbine, which automatically starts and stops the fans.

Where more heat is required (not required in these stations), an additional 1500 Btu per bhp per hour can be recovered from the exhaust as steam at low pressure or, if required, about 1000 Btu per bhp per hour can be recovered as steam at pressures up to 125 psig.

The quantity of heat recoverable from an engine depends upon the efficiency of the engine. Supercharged engines that consume 6500 Btu per bhp per hour will produce less than 1000 Btu per bhp per hour from the jackets.

If all steam recovered by the vapor phase system can be used and the condensate returned to the primary circuit, a closed engine cooling system will result, thus eliminating the necessity of providing standby steam condensers. If the process cannot use all of the steam, then the excess steam may be discharged to atmosphere or standby condensers can be installed if ample soft water is not available for make-up.

It is important to remember that all heat rejected to the circulating water is recoverable in its more useful form, i.e., low pressure steam, and all of it can be used without lowering the temperature of the circulating water below boiling.

High pressure steam from jackets

In many heating processes steam at pressures up to 50 psig (298° F) is required and many more can use steam up to 125 psig or higher. While it is possible to produce high pressure steam from the exhaust, the equipment involved is expensive and only half as much can be recovered from the exhaust as can be recovered from the jackets with a vapor phase unit.

Modern engines can, at very little expense, be equipped with plastic type gaskets and liner sealing rings and by ribbing up the water jackets high pressure steam can be generated from the waste heat of both jackets and exhaust for use in various heating processes and for generating auxiliary power, resulting in higher overall thermal efficiency with substantial savings in fuel bills.

Some modern gas compressors have cast-in cylinder water jackets requiring no seals and with modern gasket materials these engines can be safely operated at steam and water pressures of at least 50 psig.

First cost

There are many savings in the equipment and piping that, in cases of large engines, offset the cost of the vapor phase units. These are elimination of the water pumps and power to drive them, much smaller cooler to condense the steam, reduced horsepower to drive fans, elimination of the need for engine power to drive the steam turbine fans and reduced weight of the cooler.

*See "The Industrial Application of Gas Engine Waste Heat Recovery," *GAS*, July 1941.

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For further information write Oil Industry Department, Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay St., Toronto 1, Ont.

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Insulating joints in long pipelines

Part 3. Performance of lightning arresters for insulating joints

By **CHARLES RICHARD, Corrosion Engineer**
Socony-Vacuum Oil Co., Plainfield, N. J.

OUR company's experience with lightning arresters for the protection of insulated joints in buried pipelines dates back to 1949. At that time a program was begun in which air-gap arresters were installed across each of 149 insulated joints distributed along 1041 miles of product pipelines operated by our eastern pipelines division. Some joints are located at selected points in the mainlines and many serve to isolate the coated pipe from pumping stations, terminals, and other low resistance structures. Their continuous effectiveness is essential to the economical operation of cathodic protection and stray current drainage systems.

Arresters prove effective

These arresters proved entirely effective in preventing damage to insulated joints by lightning and/or power follow currents. Such damage had been characterized by frequent short-circuiting of insulated joints as a result of burning and welding of the mating flange faces, necessitating costly repairs. Burning of the phenolic sleeves or washers was common; however, our experience indicated that most arcing occurred between the internal edges of the steel flange faces. A majority of such failures were found near the bottom of the pipe, suggesting that dislodged mill scale, bridging the phenolic gasket, was responsible for determining the course of the arc. A typical failure is shown in *Fig. 1*. The rounded slot burned in the phenolic gasket material of *Fig. 1* was about ¼ in. deep; the slot was filled with ash and a solidified puddle of metal welded to each flange face.

Our earliest arresters consisted of a pair of bronze lugs secured to #00 insulated copper cables spanning the insulated joint and terminating in a suitable housing made of steel pipe fittings. The faces of the bronze lugs were separated by an air gap fixed in dimension by a sheet of perforated mica having a thickness ranging from 0.004 to 0.008 in. Although we have experienced no failure of an insulated joint equipped with an arrester, maintenance of the large number of arresters themselves became a major problem. During the summer of 1950 short-circuiting of arrester gaps by fusion of the bronze faces occurred so frequently, at widely scattered locations, that adequate inspection and repair became impossible. Also, short-circuiting of the insulating joints through the arresters, seriously interfered with the effective operation of our cathodic protection systems and stray current drainage connections.

Defect corrected

A simple modification of the arrester corrected this defect. Two machine-surfaced graphite blocks, each ⅛ in. thick,

Fig. 1. Arcing caused by short-circuiting of insulating joint has burned a groove in a 10-in. Phenolic flange gasket.

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were inserted between the bronze lugs and the air-gap was again established by a sheet of perforated mica between the graphite surfaces, as shown in *Fig. 2*. These surfaces became pitted by high electric currents, initiated by lightning, but rarely became inoperative, although in one instance the graphite blocks disintegrated as a result of passage of high current. Breakdown of the air gap is believed to occur at potentials ranging from 200 to 320 volts with mica spacer thickness of 0.004 to 0.008 in.

Kleinheksel[1] in 1950 discussed the relationship of lightning strokes and power follow currents to the burning and welding of insulated joints in buried pipelines. He attributed the severe damage observed to power follow currents initiated by lightning strokes to towers or conductors of nearby electric transmission lines. The frequency of insulated joint failures, prior to the installation of arresters, was correlated with pipeline coating resistance as shown in *Table 1*.

Referring to the data in the table, it will be noted that the ratio of insulating joint failures increased with the effective resistance of the pipe coating. Pipeline E (South Portland — Bangor, Maine) was an exception readily explained by the relatively few high voltage transmission lines intersected. Pipelines A, B, C, and D in New England, New York, and Pennsylvania were comparable with respect to such intersections. No failures were experienced among 40 insulated joints in 310 miles of pipeline in New England and New York where effective coating resistances were 2700 and 5000 ohms per sq ft respectively. Welding had occurred in 8 of 61 joints in three years, and in 15 of 28 joints in a single season in 507 miles of line in Pennsylvania having effective coating resistances of 275,000 and 1,400,000 ohms per sq ft respectively.

Other factors that are known to influence the frequency with which insulated joints are subject to excessive currents, initiated by lightning, include the following:

a. Types of electric transmission lines prevalent in the area;
b. Geometric layout of pipeline with respect to transmission lines;
c. Resistance to ground of transmission line towers;
d. Average soil resistivity.

Most of these factors were fixed but we believe that we have derived considerable benefit from the cooperation shown by all electric companies who have constructed transmission lines crossing our pipeline since 1949. Grounding of towers by means of a continuous bare wire counterpoise,

TABLE 1. FREQUENCY OF INSULATED JOINT FAILURES VS. PIPELINE COATING RESISTANCE.

Pipeline	A Providence Springfield Hartford	B Buffalo Syracuse Elmira Binghamton	C Paulsboro, N. J.; Midland, Pa.	D Malvern, Pa.; Binghamton, N. Y.	E S. Portland, Maine Bangor, Maine
Date completed	1931	1940	1947	1948	1949
Length, miles	131	279	325	182	124
Size, inches	6	6; 4	12; 10; 8; 4	8	6
Coating type	Asphalt	Asphalt	Waterworks enamel	Asphalt-mastic	Asphalt-mastic
Coating resistance* (Ohms/sq ft)	2700	5000	275,000	1,400,000	1,400,000
Insulated joints	11	29	61	28	20
Joint failures	0	0	8	15	0
Joint failures — %	0	0	13	54	0

*Effective coating resistance calculated from average value for potential drop across coating and cathodic protection current.

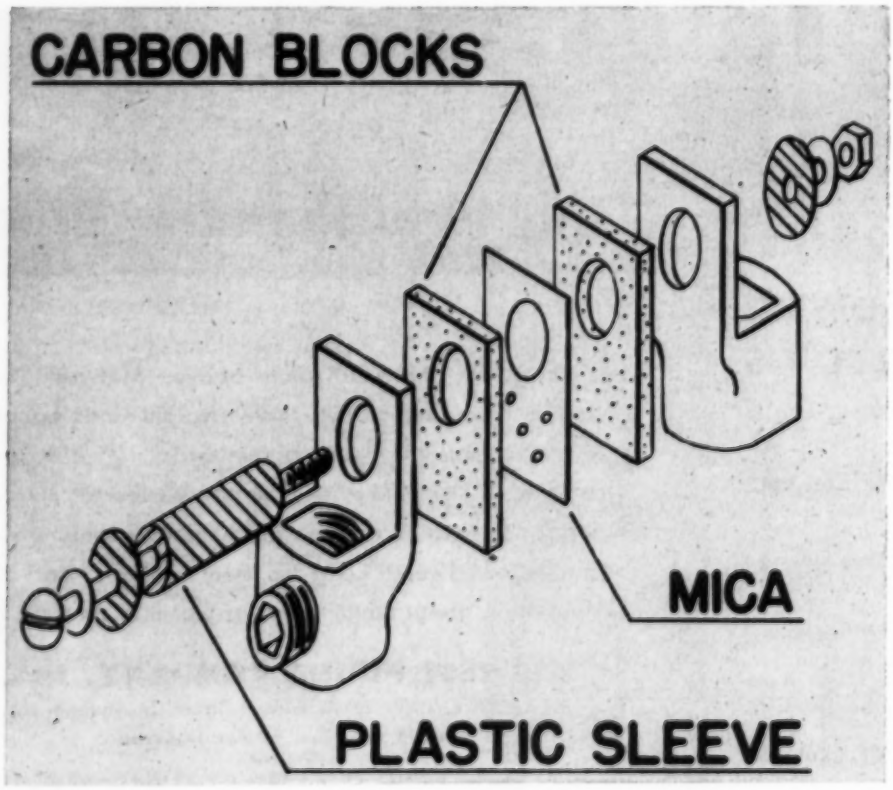

Fig. 2. Arrestor used across insulated flanges.

plowed into the earth to a depth of 24 in. is common practice. When acquainted with our problems they have readily specified the interruption of the counterpoise at points about 30 ft from our pipeline.

When installing new insulated joints, or when replacing the phenolic gasket in an existing joint, it is now our practice to specify a gasket having an inside diameter ¼ in. less than the ID of the pipeline. This eliminates the possibility of a groove between the flange edges where mill scale and rust can accumulate and increase the hazard of damage by lightning or power follow currents.

References

1. "Lightning Arresters for the Protection of Insulated Joints in Buried Pipe Lines." Stanley Kleinheksel, *Pet. Engr.*, March 1950, p. D-87-90.

Part 4 of this discussion on insulating joints begins on the next page. Parts 1 and 2 appeared in the July issue; the fifth and concluding article will appear in the September issue.

Part 4. Effect of lightning or electric power faults on insulating joints

By CARLTON L. GOODWIN, Corrosion Engineer
Portland Pipe Line Corp., Portland, Maine

THE value of insulated joints in underground pipeline systems is well recognized by corrosion engineers. The design of the modern pipeline system provides for as many insulated joints as ever will be expected to be needed. The cost of installation during new construction is very small compared to installations after a pipeline is in operation. Those not needed immediately may be easily shorted-out, to be placed in service when needed.

Partial or total failure of insulated joints from the electrical point of view may result from several causes. However, here we are considering mainly those failures caused by lightning and/or electric power fault surges, and protective measures that can be taken to prevent such failures.

Lightning arresters for insulated joints

Considerable experience has been had with the washer type of lightning arrester, the component parts of which are shown in *Fig 1*. The black spots on the two metal parts of the arrester were caused by arcing due to a lightning and/or power fault surge. In this particular instance the two metal parts were fused together when the arrester was removed from the insulated joint.

In assembly the 1/32-in. thick micarta gasket is inserted between the two ⅛-in. thick metal washers. The micarta ring is inserted on the inside circumference of the metal washers and micarta washer to insulate the metal washers from the flange stud.

The assembled arrester is in the form of a washer, the inside diameter of which is slightly larger than the outside diameter of an insulating sleeve for a flange stud or bolt. This washer type lightning arrester is installed in place of the conventional insulating washer on one flange stud or bolt on one side of the insulated flanged joint only. No insulating washer should be installed on the other end of the stud or bolt as this will cause the lightning arrester to become ineffective. This is clearly demonstrated below.

The eight 1/32-in. air gaps in the micarta gasket between the two metal washers of this arrester are the weakest dielectric points in a conventionally insulated flange joint. Therefore, any high voltage electric surge will be relieved by arcing through these air gaps before damaging other parts of the insulated joint.

It is obvious that an arrester is needed that will remain operative under severe surge conditions. However, the arrester described above has the unique quality of protecting the insulated joint after it is fused together.

Damage by high voltage surges

Lightning and/or power fault surges that seek out buried pipelines, either bare or coated, may travel for several miles before the surge is dissipated.

There is good evidence that one high voltage electrical surge, from a fault caused by a crane contacting a 110,000-volt transmission line, travelled in excess of 100 miles on an 18-in. buried crude oil line. Approximately 60% of this 100 miles of 18-in. pipeline is well coated. The coated pipe is divided into seven sections varying from a few thousand feet to 30 miles each. Each coated section is isolated from a bare section with an insulated joint; and some coated sections have intermediate insulated joints. A high percentage of this 100 miles is located in high resistivity soil in excess of 10,000 ohm- cm^3. This 18-in. pipeline also is paralleled by a 12-in. bare line in the same right-of-way. Approximately 30 miles of this pipeline right-of-way is closely paralleled by a high voltage transmission line, which in turn is tied-in with the facilities of the 110,000-volt line mentioned above.

Fortunately the insulated joints in the 18-in. line where the above described

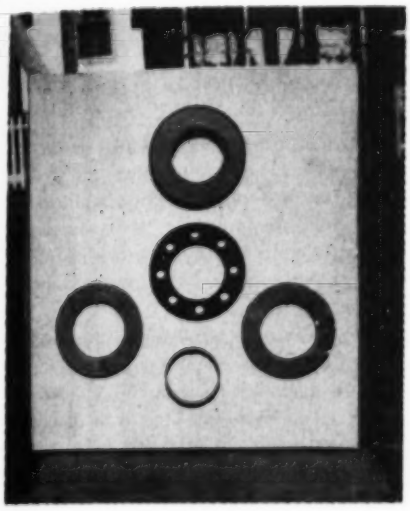

Fig. 1. Parts of washer type lightning arrester for insulating joints.

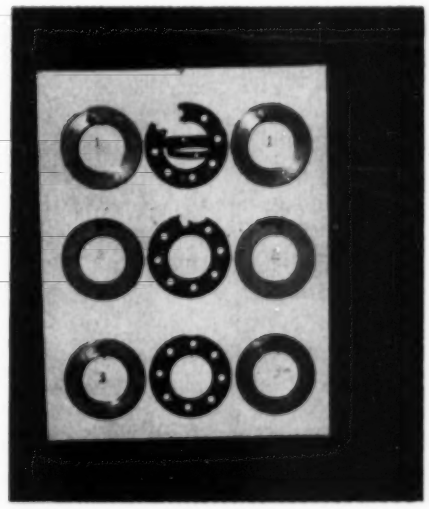

Fig. 2. Three types of arcing across washer type lightning arrester.

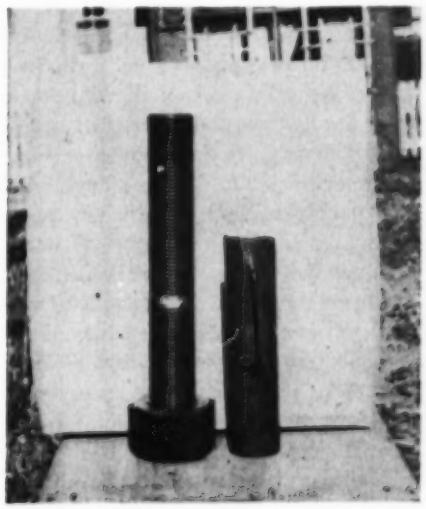

Fig. 3. Stud from insulating joint, solidly welded to inside of flange face.

These articles have been adapted from talks presented at the AGA distribution conference in April.

power fault occurred were equipped with lightning arresters of the type shown in *Fig. 1*. All of these arresters (except one) were fused together, and had done their intended job by preventing serious damage to the insulated joints. If, however, they had not fused and shorted-out, the cathodic protection would have been more effective during the time the insulated joints were out-of-service. The arresters shown in *Fig. 2* illustrate the various types of arcing that occurred in these arresters. It will be noted that Number 1 burned through the 1/32-in. micarta gasket to the outside and Number 2 to the inside.

Fig. 3 shows what happened at one location during the above described power fault where a lightning arrester was not installed properly. This faulty installation was due to an insulating washer being placed on the flange stud with the lightning arrester. An area of approximately 1 sq in. and ⅜-in. deep was burned in the 1⅜-in. flange stud. The flange stud was solidly welded to the inside edge of the flange. A heavy hammer was needed to break the weld and drive the stud out. If this fusing had occurred across the inside edges of the flanged joint the costs of repair would have been prohibitive due to necessity of taking the line out of operation for at least a day.

Lightning arresters are certainly justified in view of the trouble they will prevent. And in view of this experience of so many insulated joints distributed over many miles of pipeline being shorted-out through the surge arresters, it is perhaps best to use an arrester that will fuse together and short-out, rather than take a chance on an arrester that will burn out and become inoperative and unable to protect the insulated joints from electrical surges that might occur before the arresters are repaired or replaced.

Effect of soil resistivity on failure of insulating joints

No failures in insulated joints have been experienced in coated pipelines where a high percentage of the pipe is buried in soils having a resistivity of less than 3000 ohm-cm^3. And only occasionally does a failure occur where the coated pipe is located in soil having a resistivity of less than 10,000 ohm-cm^3.

Quite frequent failures occur where the soil resistivity averages well above 10,000 ohm-cm^3, especially if the insulated joint is between a coated and a bare section. The most frequent failures occur where high voltage power lines parallel the pipeline right-of-way quite closely in high soil resistivity locations, especially if there is considerable rock and ledge present.

Low resistance grounding of coated pipelines having insulated joints

Although no experience has been had with low resistance grounding of coated pipelines, it appears to be reasonable that such a procedure might be desirable. If a ground of 2 ohms or less could be made with zinc rods each side of an insulated joint and at one or more points between insulated joints it seems reasonable to assume that certain types of high voltage surges might be conducted to earth.

Conclusions

Insulated joints are very necessary to effectively and economically apply cathodic protection and control corrosion on long underground coated pipelines, especially where pumping stations, tank farms and other branch lines and metallic structures are tied into the main trunk lines.

High voltage electrical surge arresters should be installed in insulated joints. These are necessary due to well established facts that high voltage and current electrical surges from lightning and/or power fault sources may follow coated and bare underground pipelines for many miles.

As yet an entirely satisfactory and practical electrical surge arrester has not been developed. However, the washer type lightning or surge arrester explained above has protected insulated joints from damage. But since high current surges fuse together the metal parts and consequently short out the insulated joint until such time as the arrester is repaired, it is not an entirely satisfactory device.

Low resistance grounding of the pipelines with zinc anodes and further development of surge arresters might help solve many of the corrosion engineer's problems.

The end result of all corrosion mitigation work is to operate our metal facilities in the most economical manner.

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1. "Lightning Arresters for the Protection of Insulated Joints in Buried Pipe Lines" by Stanley Keinhekse1, *The Petroleum Engineer*, D-87 to D-90, March 1950.
2. "New Techniques—Current Problems in Controlling Corrosion" by O. C. Mudd, *Pipe Lines News*, January and February 1954.
3. "Insulated Joints in Cathodic Protection" by Marshall E. Parker. "Corrosion and Its Control" prepared in collaboration with *The Oil and Gas Journal*.

CIG lends fast assist to city during emergency

Colorado Interstate Gas Co., normally a natural gas transmission company, stepped into a new field recently when a severe water shortage threatened Colorado Springs, site of the company's general offices. Colorado Interstate undertook construction of a water pipeline to help the community quickly solve a pressing problem.

Speedy construction of pipeline facilities to make 4.8 million gal. of water daily available as quickly as possible was the major problem.

Services offered

Colorado Interstate offered its services; the offer was quickly accepted, and work started on action construction within 24 hours of the signing of the water contracts, which would be brought from underground sources on nearby ranch property.

The transmission company furnished 3½ miles of 16-in. pipe from inventory at cost; made arrangements for the labor involved in laying the line to be done at cost; and handled the purchase of three miles of 12-in. pipe for a second phase of the work.

Pipeline crews of R. H. Fulton & Co., Lubbock, Texas, were brought to the Pikes Peak area from three different construction jobs in neighboring states at no cost to the three groups participating in the emergency water project. All necessary work on surveying the proposed route, acquiring rights-of-way and engineering the pipeline was carried out by Colorado Interstate.

Crews at work

One day after water contracts were signed, ditching crews were working on the proposed route of the 16-in. line. As soon as this was finished, work was started on the ditch for the 12-in. line. A total of 50 men plus 20 pieces of heavy equipment were working at top speed within 48 hours.

C. F. Brunston, vice president in charge of operations for Colorado Interstate, assumed overall command of the work. The company also handled arrangements for installation of three pumps and construction of concrete foundations.

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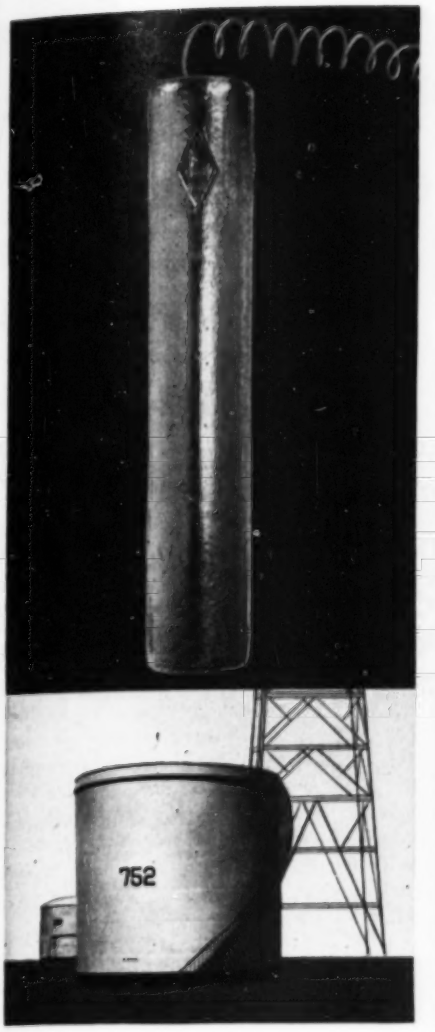

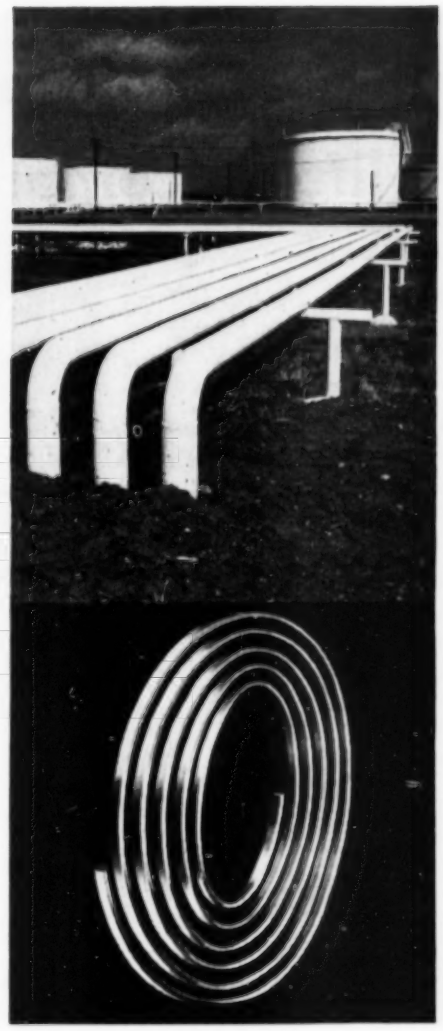

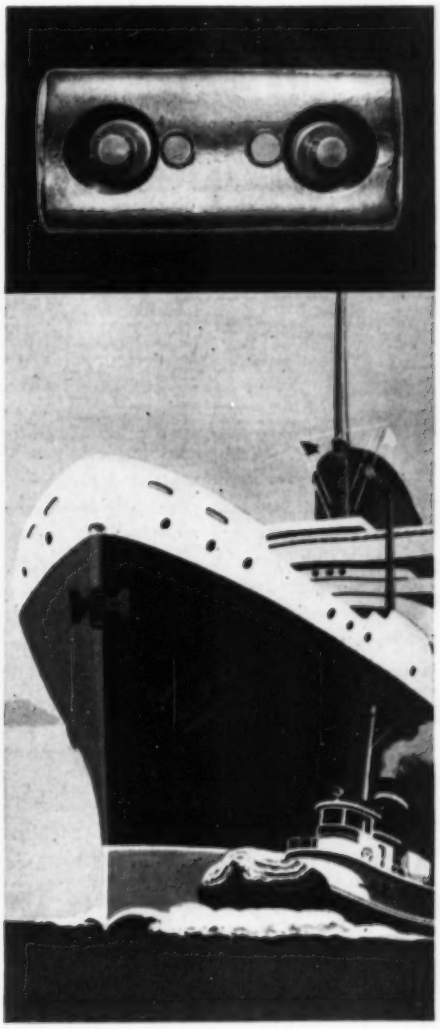

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The importance of maintaining proper valve lift on compressor valves

By A. R. WORSTER • Ingersoll-Rand Co., Painted Post, New York

THE history of the compressor industry shows that the most important part of a compressor is its valves. It has often been said that the valve is the heart of the compressor. The complexity of valve problems has been constantly increasing since automatic compressor valves were first introduced in the early 1900's. The trend toward higher rotative speeds and higher pressures sometimes creates problems and field difficulties that might be avoided if operators were better acquainted with valve design problems and limitations. In recent years cooperation and coordination between the operator and designer have improved materially and this has definitely influenced new designs.

As valve problems have become more severe there has been more concentrated effort applied to valve research. Investigating techniques have improved.

Steady flow wind tunnel and hydraulic steady flow testing have been utilized and, as a result, improvements have been made in the flow lines of valves to reduce pressure losses.

Motion studies have been made using mechanical pick-ups, electronic pick-ups, high speed motion pictures, and stroboscopic light through glass windows. These have resulted in better understanding of the effects of air cushioning, valve flutter, spring surging, valve timing, and transient impact forces.

New types of pressure indicators have permitted more accurate analysis of valve performance both in the field and in the laboratory.

More precise evaluation of field endurance by closer contacts with installations has been of primary importance, as no amount of laboratory testing can duplicate the conditions met on the job.

All of this concentrated effort on valve development has resulted in a better understanding of the problems that are involved.

If the valve designer is asked to state what he feels is the most important factor in compressor valve design the answer is simple. For any set combination of operating conditions and valving the first question is, "What is the proper valve lift?" On new valves the whole design centers around this one variable. On existing lines of valves the lift affects both efficiency and durability. It can be generally stated that in both cases too high operating lifts result in premature failures due to impact fatigue. Too low lifts result in inefficient use of the available space and high valve losses.

LET us examine some of the factors affecting valve lift that are found on various applications. The most economical valve to produce is one that can be used for many different types of services. It has been found, however, that no valve is suitable for all services. It is essential to have several valve designs available to adequately valve compressors. This permits handling the unusual application without sacrificing efficiency on the average job.

Assuming a new valve is to be developed, the first problem is to determine the design lift of the valve. The factors involved might be put into two classifications as follows.

Internal factors

1. General valve type (simple ring, ring plate, leaf, strip channel, etc.)
2. Spring type (coil, strip, flexible arms, etc.)
3. Spring characteristics.
4. Type of cushion (if any).

External factors

1. Rotative speed.
2. Air speed.
3. Pressures.
4. Compression ratio.
5. Gas characteristics.
6. Line pulsations.

The internal factors are under the control of the designer. The external factors define the operating conditions and normally cannot be changed except in the cases of excessive dirt, liquid, or line pulsation.

After a general study of the applications involved and a review of past history, the general type of valve is selected. The other general details such as type of spring, spring characteristic, and cushion are a part of this selection. At this point in the design study of a new valve the operating lift must be selected. The two most important factors that determine this selection are rotative speed and valve cushion.

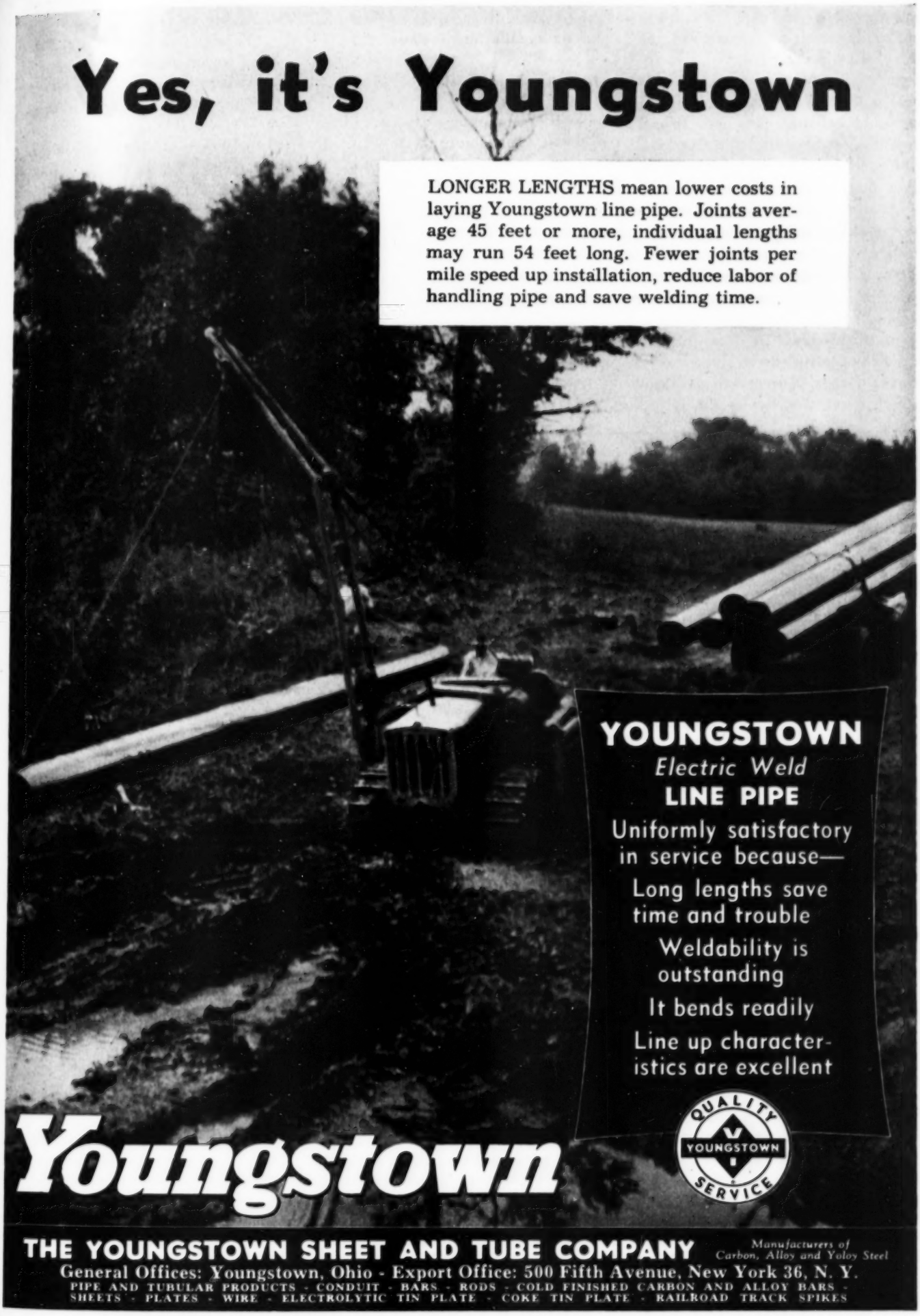
The rotative speed is the most important factor affecting design lifts. For example, experience has shown on one valve design that good durability is maintained using .200-in. lift at 300 rpm. With the same basic design, it is necessary to reduce the lift to .040 in. when running at 1800 rpm.

The second factor is not often recognized. This is the value of incorporating an air cushion. Most valve plate failures are caused by stop plate impact, which increases with increasing lift. The use of a cushion reduces this impact and thereby permits higher lifts, resulting in a more efficient overall design.

Most severe stop plate impact is found on discharge valves. The valve is opened by differential pressure between the inside of the cylinder and the cylinder passage. During the valve-opening period the differential pressure is increasing rapidly, which results in a high accelerating force on the valve plate and a high velocity of the valve plate when it approaches the stop plate. The valve-opening portion of a valve lift-time diagram is shown on *Fig. 1*. This diagram shows that the first portion of the valve lift curve is identical on both cushioned and non-cushioned valves. In non-cushioned valves, the valve plate

This article has been adapted from a talk presented at the NGAA Permian Basin regional meeting in Odessa, Texas, in February.

Yes, it's Youngstown



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and stop plate come together with full impact. In an air-cushioned valve, the valve plate is slowed down as it approaches the stop plate. The air trapped behind the valve plate is compressed momentarily, which provides a retarding force. It also acts as a dash pot, which helps reduce the possibility of valve flutter.

Air cushion studied

The air cushion on channel valves has been studied in several ways in an attempt to gain a better understanding of its effectiveness. The most interesting method is the use of a stroboscope for visual study. With normal side clearance between the channel and spring, the valve is quiet and there is a noticeable slowing down of the channel as it approaches the stop plate. Removing the cushion by increasing the spring side clearance results in a greater channel to stop plate impact and a noisy valve.

Experimental valves

Once the valve lift has been selected the other proportions of the valve can be filled in and experimental valves made. Efficiency and endurance tests are run. It is impossible to duplicate the wide variety of field operating conditions in laboratory test work. This means that the final proving must be done in the field. There will always be the unusual operating condition that will dictate changing the lift after a valve has proved successful for other applications. Generally speaking, juggling of valve lifts should be avoided unless the manufacturer is consulted.

Unintentional lifting

Many operators have experienced the bad effects of increasing the valve lift unintentionally during the valve maintenance work and have come to appreciate the importance of maintaining proper lift. Other operators have experienced random premature failures that have been caused by excessive lift without realizing the cause. More careful attention to holding proper valve dimensions on maintenance work will improve the overall compressor performance on many installations.

The effect on efficiency of reducing valve lifts is not as well known. Valve characteristics are not identical; consequently there are no rule-of-thumb methods of estimating the effects of changing the lift. The characteristic pressure loss-lift curves of two different designs of typical compressor valves are shown on *Fig. 2*. The curves are made for fixed velocity and fixed density in order to show only the effect of changes in lift. For simplicity the lift is indicated in per cent of full lift and the pressure loss is on an arbitrary 0 to 100 scale. Full lift on both valves is defined as the maximum allowable for satisfactory durability.

Valve A represents a well designed valve. The pressure loss is approaching a minimum at full lift. Small variations in lift either over or under full lift have little effect on pressure loss.

The design of valve B is not as good. Increasing the lift would improve the efficiency. Any reduction in lift will noticeably lower the efficiency.

Consider now what happens if the lift is reduced in the field either intentionally due to premature valve failures or unintentionally due to poor maintenance. Reducing the lift of valve A to 80% of full lift results in a 14% increase in pressure loss. Reducing the lift on valve B to 80% of full lift results in a 37% increase in pressure loss, which has a much greater effect on compressor efficiency. This simply emphasizes the fact that valve lifts should not be changed unless there is a real reason for doing so.

It now becomes obvious that the design lifts of compressor valves are a result of careful consideration. Operating lifts are often a compromise between the desirable high lift for maximum efficiency and the desirable low lift for maximum durability. For these reasons care should be exercised when valves are reconditioned. The lift is often difficult to measure accurately. Depending on the design it may be affected by dimensions of the seat, stop plate, valve plate, and spring. Maintenance groups should be fully informed of the importance of maintaining design life.

General discussion

The discussion thus far has been very general. The attempt has been to point out the factors that are normally of primary importance without clouding the issue with unusual effects that are often encountered. Compressor valve action is often unpredictable. The valve action is not positive as is an engine valve, which is cam-operated. A few

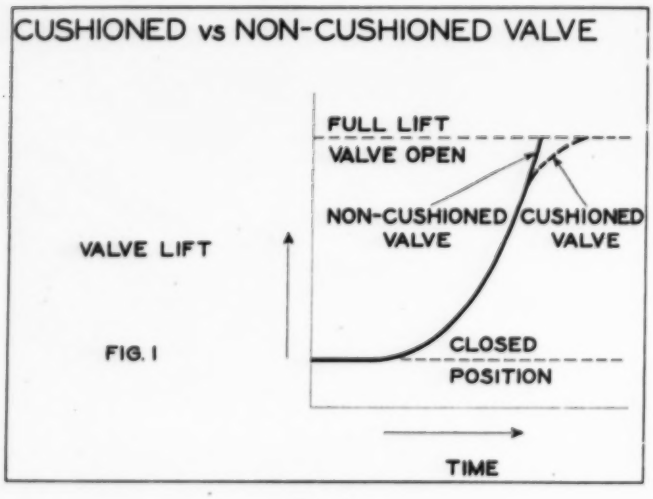


FIG. 1

Fig. 1.

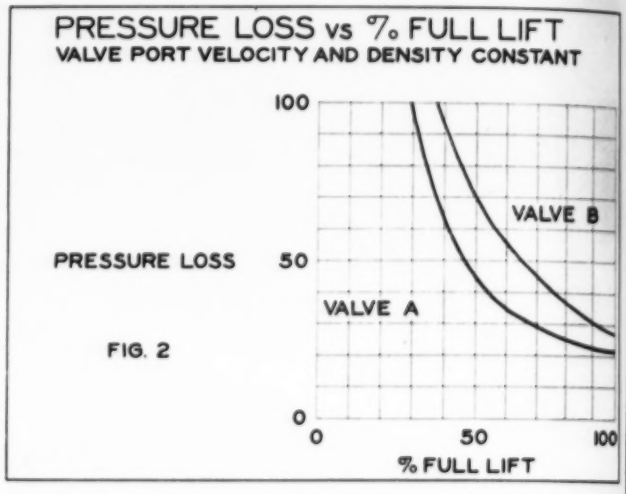
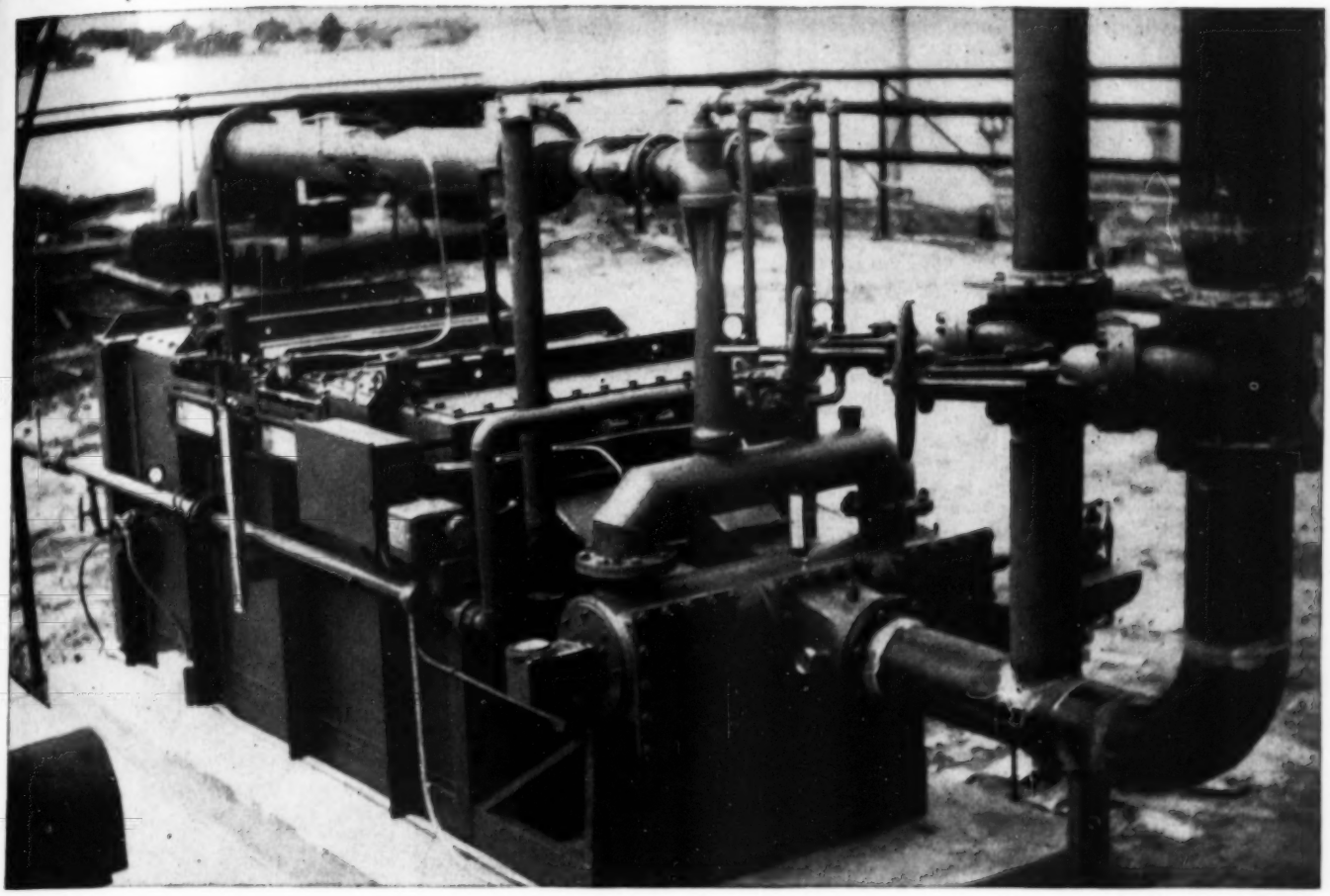


FIG. 2

Fig. 2.



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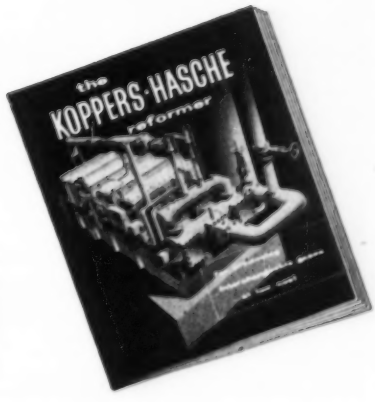

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case histories will bring out some of the unusual effects that have been encountered.

Low lift

It was indicated earlier that for any given set of conditions the best results from the durability standpoint are obtained with low lift. As the lift is increased the frequency of failures increase. An exception to this was found on an application in an alkali plant. The first valves installed became completely fouled in two or three days of operation. A different valve design was substituted, which improved the situation, but the valves still had to be cleaned every two or three weeks. The trouble resulted from heavy crystalline deposit. It was realized that to improve the valve service the crystalline deposit would have to be reduced. The use of solvents was objectionable. The second valve design was revised to increase the normal lift from .120 in. to .230 in. to see if the extra impact would shake the deposit from the moving parts, realizing that the valve plate life would be poor. The build-up of deposit was materially reduced, and surprisingly, the valve plate life was not seriously affected. The heavy deposit that fouled up the action of the valve acted as a cushion to reduce the impact forces to a tolerable amount.

Valve flutter

Another unusual and interesting case is one of valve flutter on a ring valve. In this case there appeared to be nothing unusual as the application was a typical low-ratio unit, and yet premature failure of the valve plates and springs indicated an investigation was needed. It was discovered that although there were several engine - driven units involved there was no pattern to the trouble. Continued investigation correlated unusual valve noise with the failures. The noise might best be defined as a sneezing valve action. The flutter was affected by air speed, valve springs, and gas density. It was found that reducing the lift from .120 in. to .090 in. completely eliminated the flutter. An indicator test was made to determine the effect on efficiency. In this case, fortunately, reducing the lift only increased the horsepower 1% to 2%. Reduced lift usually raises the losses more than this on low ratio compressors.

Third case

A third unusual case was on a high-ratio, high-clearance cylinder with a low N-value gas. The discharge valve life was very low. Investigation of the application revealed that under some conditions the valve was opening so late in the stroke that the lift was increasing when it should normally be decreasing at the end of the stroke. This caused late closing of the valve and excessive seat impact. Increasing the valve springing helped. The best solution and one that was used on later units was better sizing of the cylinders to eliminate the use of excessive clearances to prevent overloading. This is practical in many cases if careful consideration is given to the range of operating conditions that must be met.

These three examples show that there may be exceptions to any general conclusions that may be reached on valving. A large part of the designer's problem is to keep the unusual from seriously affecting his design consideratons.

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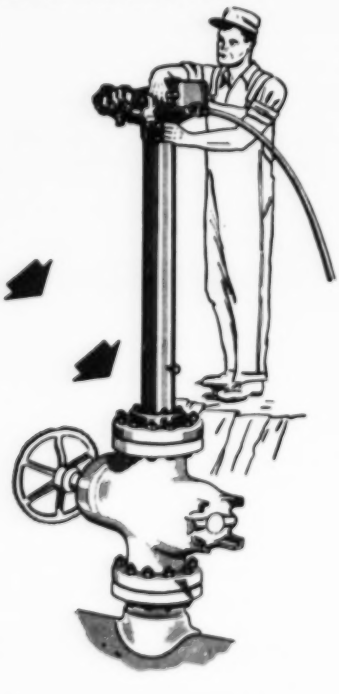

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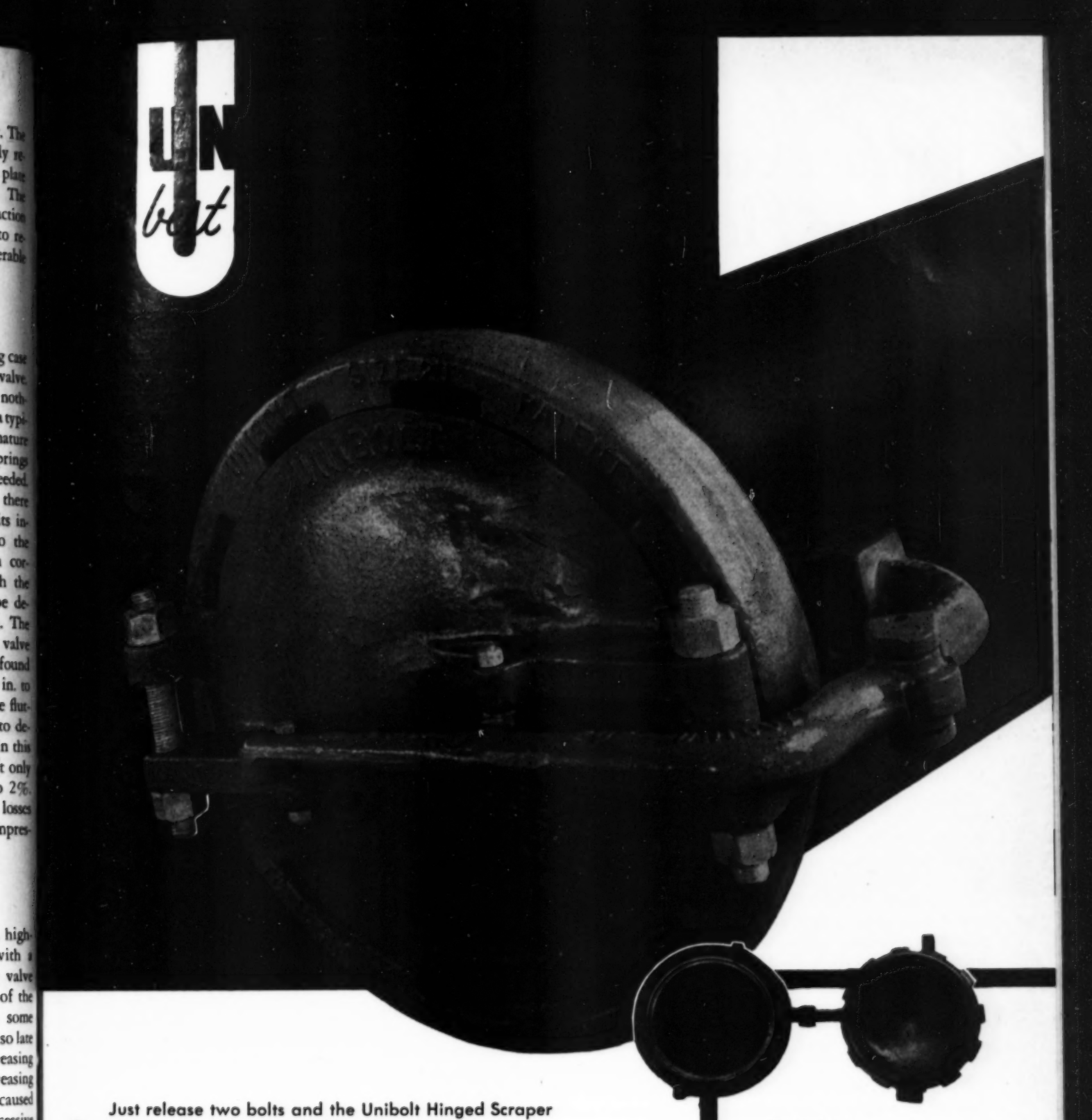

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Pipeline Communications and Electronics

By FRANK CHAPMAN

Survey report on microwave

(For comprehensive report of survey, see pages 37-41)

QUITE often we find ourselves so much concerned with the detail of our day-to-day problems that we fail to appreciate the magnitude and importance of that phase of the industry of which we are a part. It's like being too close to the trees to see the size—and beauty, if you will—of the forest.

Also, because we often neglect to stand off and take an objective look at the whole field in which we work we tend to become overcritical and restless with our progress. Our own detail problems take on an importance that appears to reflect the status of the art as a whole, and it is sometimes not to our liking.

Those in the industry who work with microwave radio are, because of its newness and the rate at which it has grown, at times troubled with this affliction. Reflection upon the present size of microwave radio in the industry, how it came to be as large as it is, and plans that have been laid for its future growth, as brought out in a radio survey by *GAS* magazine and reported upon in the distribution section of this issue, will be something of a tonic for those who have been too close to the trees for too long a time.

It should be encouraging to those close to microwave in the industry to realize that it has grown, only during the past four years, into a strong right arm for the industry—a service in which the industry has invested several million dollars. It should also be encouraging to know that the industry is making extensive plans for the expansion of its use of microwave communication facilities during the coming months, and that new systems are planned by companies not now using microwave.

The survey showed that the use of microwave by large gas transmission companies is nearly unanimous. Only one company out of 10 of the country's largest that responded to the questionnaire does not have microwave. The remaining nine reported they have a total of 271 stations, 7291 circuit miles of system, and 57 channels in operation for a total of 58,898 channel miles. It is estimated that these nine have an investment in excess of $5.5 million in microwave facilities.

On this basis, it is estimated that the country's 20 major gas transmission companies, all with more than 500 miles of line and revenues in excess of $5 million, have a total of more than $11 million in microwave. Not included are the smaller transmission companies and those distribution companies that make use of microwave. Additionally, it is estimated that annual expenditures for microwave by these same 20 top companies has been nearly $3 million. Prediction as to future expansion, brought out by the survey, also indicates a continued expenditure of approximately this amount during the coming year.

This is an encouraging picture. It is reported that during 1953 more than $20 million worth of microwave equipment was sold to all private industrial users. The 20 major gas transmission companies alone had an estimated 15% of this annual expenditure. It is reasonable to assume that purchases by smaller transmission companies (there are a total of 39 natural gas transmission companies in operation, according to latest figures) and gas distribution companies may have pushed this figure to more than 20% of the total microwave sales to private industry.

On the matter of system size, it is reported that the nation has some 33,000 channel miles of microwave TV relay system in operation at the present time. In comparison, it is estimated that the gas industry's 20 major transmission companies have a total of 118,000 channel miles in use. The longest microwave system now in use is Transcontinental Gas Pipe Line's 1800-mile Texas-to-New Jersey system. This one system has a total of 18,000 channel miles in operation, or more than half the length of the country's total microwave TV relay system.

Plans for the future are as encouraging as the present picture. Five of the 10 major gas transmission companies responding to the survey outlined specific plans for the expansion of their systems. These plans call for the addition of channels, new remote control mobile stations, additional telemetering facilities, standby equipment, the extension of existing systems and the addition of entirely new links. Several companies told of the plans for new microwave systems and of systems currently under construction.

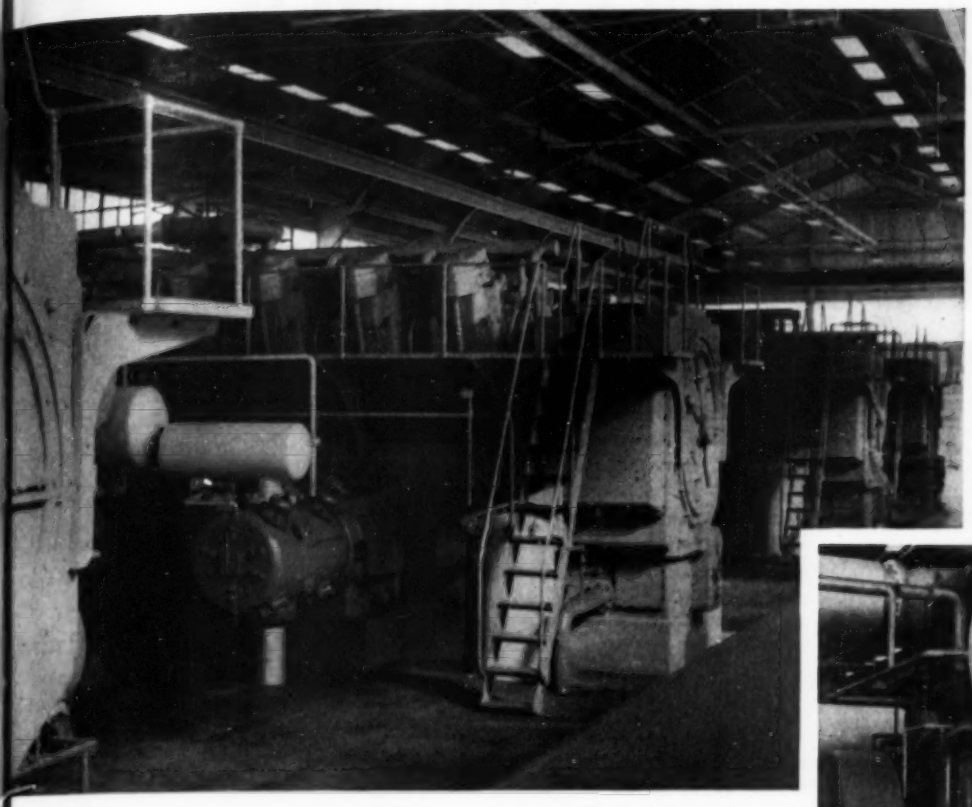
It is difficult to picture the future of microwave to the fullest advantage because of the new and different functions to which it is being applied almost daily by the industry. Any estimate as to the future can only express the minimum use to which microwave will be put. For one thing, there is the arrival on the scene of the technique that has come to be known as "Automation," which promises to make extensive use of microwave. Other factors include the expanded use of telemetering and remote dispatching.

Altogether, the industry's use of microwave presents an imposing picture today. Beyond this, plans for expansion indicate something of the success that microwave has experienced in company operations and the faith that management has in its future value. It is unfortunate that day-to-day problems should at times cloud this picture for the engineers who are close to it and responsible for its success.

Petroleum communications groups hold meet

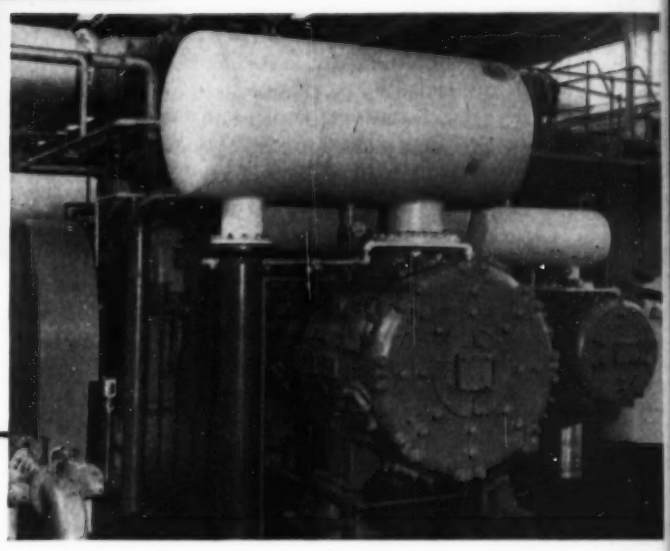
The semi-annual meeting of the central committee on radio facilities of the API and the annual meeting of the National Petroleum Radio Frequency Coordinating Association were held in Washington, D. C., on June 9-10.

Joseph E. Keller, special representative of both groups, reported on activities of the FCC of interest to the petroleum industry. He discussed the use of 72-75 mc. and 450-460 mc. bands, the pending petition filed by the central committee requesting 20 kc. sep-



Shown here are the four Cooper-Bessemer compressors, rated 2000 hp at 250 rpm, in Spencer Chemical's modern Vicksburg, Mississippi ammonia plant. These 8-cylinder GMW's compress process streams such as natural gas, synthesis gas, and nitrogen.

Another Example of Efficient Power at Lower Cost



This close-up view of a Cooper-Bessemer GMW clearly shows the neat, simple arrangement of compressor cylinders.

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Add to these features the continued smooth-running performance of Cooper-Bessemer compressors, and you will realize why so many progressive companies rely on V-angles — GMW's, GMV's and GMX's. For additional information, contact the office nearest you.

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aration in the 25-50 mc. band, the request for extension of authority for the use of *Shoran* frequencies, and the latest developments with respect to microwave.

An important item on the agenda was the presentation of the proposed by-laws of the Microwave Users Council. By adoption of the by-laws the committee approved its participation in the activities of the council. The central committee has now joined the American Association of State Highway Officials, the American Association of Railroads, the Committee on Manufacturers Radio Use, the Forestry Conservation Communications Association, the International Municipal Signal Association, the National Bus Communications Committee and the National Committee on Utilities Radio in approving participation in the Microwave Users Council.

The present officers of the National Petroleum Radio Frequency Coordinating Association were all reelected for another year. H. A. Rhodes, Transcontinental Gas Pipe Line Co., will continue as chairman; C. D. Campbell, Humble Pipe Line Co., will continue as vice chairman; R. D. Wyckoff, Gulf Research & Development Co., will continue as secretary-treasurer.

Onan technical bulletin available

A technical bulletin covering the installation of emergency standby electric generating plants and automatic line transfer control equipment has been issued by D. W. Onan and Sons Inc., of Minneapolis.

Intended "for the man who knows very little about the subject," the bulletin describes electric generating plants, control methods and other semi-technical subjects in relatively simple language.

Typical installations of both water-cooled and air-cooled standby plants are pictured, including diagrammatic illustrations of circuit wiring and other detailed information.

The booklet, known as technical bulletin T-011, is available from the manufacturer.

Recent FPC authorizations

Gulf Interstate Gas Co., Houston, for one base station near Means, Ky., on 48.72 mc.

Gulf Interstate Gas Co., Houston, for one base station near Catlettsburg, Ky., on 48.90 mc.

United Natural Gas Co., Oil City, Pa., for two base stations at Banezette, Pa., on 48.98 mc. and 451.55 mc. and one fixed control unit near Driftwood on 456.55 mc.

Gulf Interstate Gas Co., Houston, for two base stations at Corinth, Miss., and near Morehead, Ky., on 48.72 mc.

Tennessee Gas Transmission Co., Houston, for three base stations near New Albany and Isola, Miss., and near Winnsboro, La., on 33.26 mc.

Permian Basin Pipeline Co., Omaha, for one base station at Midland, Texas, on 33.18 mc.

PIPELINE NEWS

Pacific Northwest

(Continued from Pipeline Cover)

N. Henry Gellert, president of Seattle Gas Co., an outspoken supporter of Pacific in its FPC fight with Westcoast, says natural gas is the one thing the Northwest needed to become a great industrial area. He said the Seattle Chamber of Commerce has informed him that many manufacturers have indicated a desire to locate in the area when natural gas becomes available.

To expand the company's system to accommodate the industrial development, Seattle Gas expects to spend about $14 million. Washington Gas & Electric, which serves Tacoma and a number of other Puget Sound communities, expects to spend from $4 to $9 million. Cascade Natural Gas, with distribution companies in 15 small cities, will invest about $10 million to utilize natural gas.

A proportionate amount will undoubtedly be invested by Portland Gas & Coke Co., the Northwest's largest distributor which serves Portland and most towns in the Willamette River valley of western Oregon.

Cities in southern Idaho, which have not had manufactured gas, will receive brand new distributing systems.

Uniform wholesale rates to distributors for each clas sof service at the same load factor will apply throughout the area served by the pipeline. Mr. Herring expects the region's average load factor to be about 84%, which would place the average rate at 32 cents per Mcf.

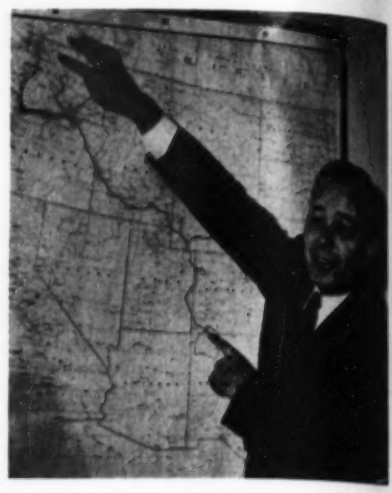
Pacific expects to sell 364 MMcf of gas per day in the third year of operation at which time looping will begin to increase the line's capacity.

Most of the company's initial supply will come from the San Juan basin, where 3.045 trillion cu ft of its total 3.667 trillion reserve, are located. Additional gas will be picked up in the Piceance creek area of Colorado, and from the Tip Top and Big Piney fields of Wyoming where development, stepped up by the assurance of a market, is expected to prove reserves far in excess of the line's reuirements.

Eight compressor stations will be a part of initial construction, and six more will be added by the third year so that 14 stations, with a total horsepower of 81,120 will power the line.

The welded steel line will be 26 in. at the southern end and graduating to 6 in. at the extreme northern terminus, Bellingham, Wash., near the Canadian boundary.

A processing and dehydration plant will be built near Ignacio, Colo., to recover 30% of the propane and 85% of the butane and substantially all of the hexanes and heavier liquid hydrocarbons in the gas.



Pacific Northwest President Williams points out extent of line.

About 3 million persons in Washington, Oregon, southern Idaho, eastern Utah, southwest Wyoming and western Colorado will be served by Pacific's line.

The first sale is to Colorado Interstate Gas Co. As approved by the Federal Power Commission at the same time that Pacific's line was certificated, Colorado Interstate will take 110 MMcf for delivery to Denver and other Colorado points. (See story below.)

Natural gas is expected to double the Pacific Northwest's energy base. In a region that has seen tremendous industrial development follow utilization of the area's rivers for hydroelectricity, one comparison makes planners' eyes pop. In the third year, the pipeline will match the daily energy production of the Bonneville and Coulee dams on the Columbia river.

The Northwest's optimism of the past has been based on hydroelectricity. But as kilowatts become more costly, and as power shortages threatened, the need for an additional source of energy became apparent. The region does not have a large supply of high quality coal, and fuel oil is brought by tanker from California and by pipeline from Alberta.

Electric companies welcome natural gas. Competition on the domestic level will be gradual. Industrial development caused by gas will create demand for electricity for such things as turning motors. And electricity now being used for thermal purposes can be released for more efficient application. By taking some of the heating load, winter peaks may be made less severe and shortages more remote for electric companies.

Only one threatening cloud remains of the original controversy about the source of supply for the Northwest. Westcoast Transmission, the unsuccessful Canadian applicant, has askedth e FPC for a rehearing, which the commission has 30 days to con-

sider. If the request for a rehearing is rejected, Westcoast will have 30 days to appeal to the courts for a rehearing.

Pacific officials are confident that the order was so clear cut and overwhelmingly in favor of Pacific, and the denial of Westcoast's plans was so emphatic, that the appeal will get nowhere.

The FPC's decision caused a very bitter reaction in western Canada, especially in Vancouver, B. C., which had been counting on gas from Westcoast's Peace river elds and benefits from development along the way.

Pacific has alternate offers to Canada pending that would relieve Vancouver's situation. It would extend its line from Bellingham, Wash., to bring San Juan gas to Vancouver. Or Pacific would take gas from southern Alberta for delivery "in bond" through the northern part of the system to Vancouver. Prairie Pipelines Ltd., an affiliate company, has applied to Alberta for permision to take surplus southern Alberta gas.

The finding of the FPC that caused the loudest noises of protest in Canada was that the commission would be unable to completely regulate the Canadian line and therefore could not give fullest protection to U. S. customers. That the FPC is precisely charged with that responsibility by the Natural Gas Act, made no difference.

However, the commission mentioned some positive reasons for choosing Pacific's plant. It said Pacific would serve a far greater area; that about a million more persons would be served by U. S. gas; and Pacific's project would develop at least three large undeveloped fields in Colorado, Utah and Wyoming, thereby adding to the nation's resources of natural gas.

CIG's Rock Springs-Denver line also approved

As a result of its approval of the Pacific Northwest Pipeline Corp. plan to serve the Pacific Northwest, the FPC also gave its sanction to the construction of a 365-mile, 22-in. line by Colorado Interstate Gas Co. from Pacific Northwest's system near Rock Springs, Wyo., to Denver.

The Colorado Springs company will construct a compressor station of 4400 hp at the point of junction with the Pacific line. From the junction point, Colorado Interstate will build its line eastward across the southern portion of Wyoming past Rawlins. Near Laramie the line will go southeast past Fort Collins and Boulder to Denver, where it will tie into the company's present system.

The Rock Springs-Denver line, which cost approximately $23 million, will be capable of initially transmitting 118 MMcf of gas daily and will be so constructed that the addition of three compressor stations will boost the line's capacity to 214 MMcf of gas daily.

Welcomed as will be the supplies of San Juan basin gas to the Rocky Mountain market, CIG President W. E. Mueller said the future potentialities of the FPC decision will

New supercompressibility apparatus termed improvement on Burnett design

A NEW supercompressibility apparatus has been developed by the Ruska Instrument Corp., Houston, for determining the deviation of a gas' behavior from Boyle's law.

The instrument is based on the original Burnett apparatus of the U. S. Bureau of Mines, but is completely redesigned and rearranged to increase its accuracy and improve its performance. It consists of two interconnected high pressure chambers of known volume ratio. The gas to be tested is expanded from the first chamber to the evacuated second chamber, the drop in pressure being determined while a constant temperature is being maintained. The characteristics of the gas are determined at temperatures constant to ±0.005° C. Pressure variations as small as ±0.01 psi at pressures in excess of 2000 psi can be determined.

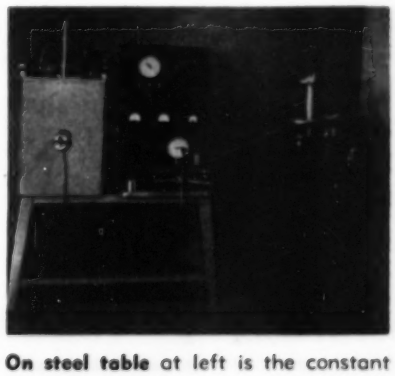
Ruska has recently completed the first such supercompressibility apparatus for the research laboratory of Stanolind Oil & Gas Co., Tulsa, Okla.

The expansion cell is made of stainless steel and has two cavities of approximately 50 cu in. and 24 cu in. An insertable stainless steel plug with a volume of 11.5 cu in. is furnished to reduce the volume of the smaller chamber. The closure of the larger chamber forms a part of the housing of a double-contact diaphragm differential pressure indicator, which thus becomes a part of the cell assembly. This assembly is suspended in a vertical position from a stainless steel channel in its constant temperature bath. Attached to the channel are two manifolds, one connecting to the vacuum system, the other to the gas system. All operating valves, adjusting knobs for the diaphragm indicator, controlling thermostat, reference thermometer, etc., are also supported by this channel so that the assembled cell unit with all valves, lines, electric connections, etc., can be readily removed from and reinserted into its bath.

The constant temperature bath consists of a steel tank heavily insulated with compressed glass wool and covered with plastic lids. Two vertical side ducts with stirring or circulating motors are provided, one containing an electric heating unit and the other, copper cooling coils. Baffles in the exit opening of these ducts give the fluid in the bath a swirling motion and assure uniform heat distribution. The temperature of the bath is controlled by an adjustable mercury thermostat with sensitivity of at least ±0.01° F and a range of —35° to +350° F. The temperature control system has proven very sensitive and accurate and produces a minimum of temperature "ripple." A secondary adjustable bimetallic thermoswitch operates a signalling buzzer so that bath temperatures can be changed without the operator having to watch the thermometer. The attendant is called when the bath has reached the temperature for which the thermoswitch has been set.

The bath is mounted on a low steel table at such a height that the diaphragm in the cell is at the same level as the lower end of the cylinder of the dead weight gauge, if the gauge is placed on a standard 30-in. table. A No. 2400L Ruska dead weight gauge is used with added fractional weights, so that pressure changes to 0.01 psi can be determined. The hand pump is mounted on the steel table. A level indicator is provided in the oil line from the hand pump to the differential pressure indicator so that the diaphragm can be balanced for zero pressure differential.

A steel frame, or chassis, covered in front by a bakelite panel, contains all the electric, electronic and vacuum controls. Mounted on the panel are the Bourdon tube vacuum gauge and the indicating meters of the Pirani high vacuum gauge, the meter of the diaphragm differential indicator, control transformer, heater control switch and all operating switches and signal lights for the control thermostat, Pirani gauge, etc. Mounted in the steel frame are the electronic and electric sub-units for the thermostat, differential pressure indicator and Pirani gauge, the Pirani tubes, vacuum lines and all electric wiring.



On steel table at left is the constant temperature bath and control panel. Dead-weight gauge is on right-hand table.

do much to encourage exploration for and development of natural gas along Colorado's western slope and in the southern portion of Wyoming.

It is contemplated that construction of the spur line probably will start sometime this summer and will be completed in time for the 1955-1956 heating season.

Colorado Interstate has also signed contracts with a number of gas producers in the Little Beaver and Adena fields in northeastern Colorado and it is expected that other producers will sign similar agreements shortly, clearing the way for CIG to file with the FPC an application for a gas line approximately 70 miles in length to serve the city of Fort Morgan.

Producers in the fields have estimated to CIG that there is between 125 and 150 billion cu ft of gas reserves in the area.

Northern Natural would build North Dakota line

Northern Natural Gas Co., Omaha, has made formal application to the North Dakota Public Service Commission for authority to build a pipeline across the state, which might result in shifting of a proposed gas line terminus from the Twin Cities area to Tioga, N. D. (See GAS, June, page 124.)

Northern Natural's application conflicts directly with North Dakota Natural Gas Transmission Co.'s plan, which was conditionally approved recently. Meanwhile, North Dakota Natural has asked the North Dakota commission to reopen the hearing on its case because the company says it cannot meet certain conditions imposed by the commission (see July GAS, page 112.)

Northern Natural has applied to the FPC for authority to import 100 to 150 MMcf of gas per day from Canadian fields in Alberta. If the North Dakota commission grants it a certificate, the company would provide for delivery of the Canadian gas at a point north of Tioga, instead of to a point south of Winnipeg in the Twin Cities area of Minnesota.

In addition, Northern Natural said it would purchase 30 MMcf per day from the Williston basin of North Dakota. Estimated cost of the pipeline and border stations was set at $18,494,000.

Construction under way on Niagara-to-Toronto line

Consumers Gas Co. of Toronto has let a contract to Gragg Inc. to lay a 21-mile, 20-in. line from the western border of its franchise area to the heart of Toronto.

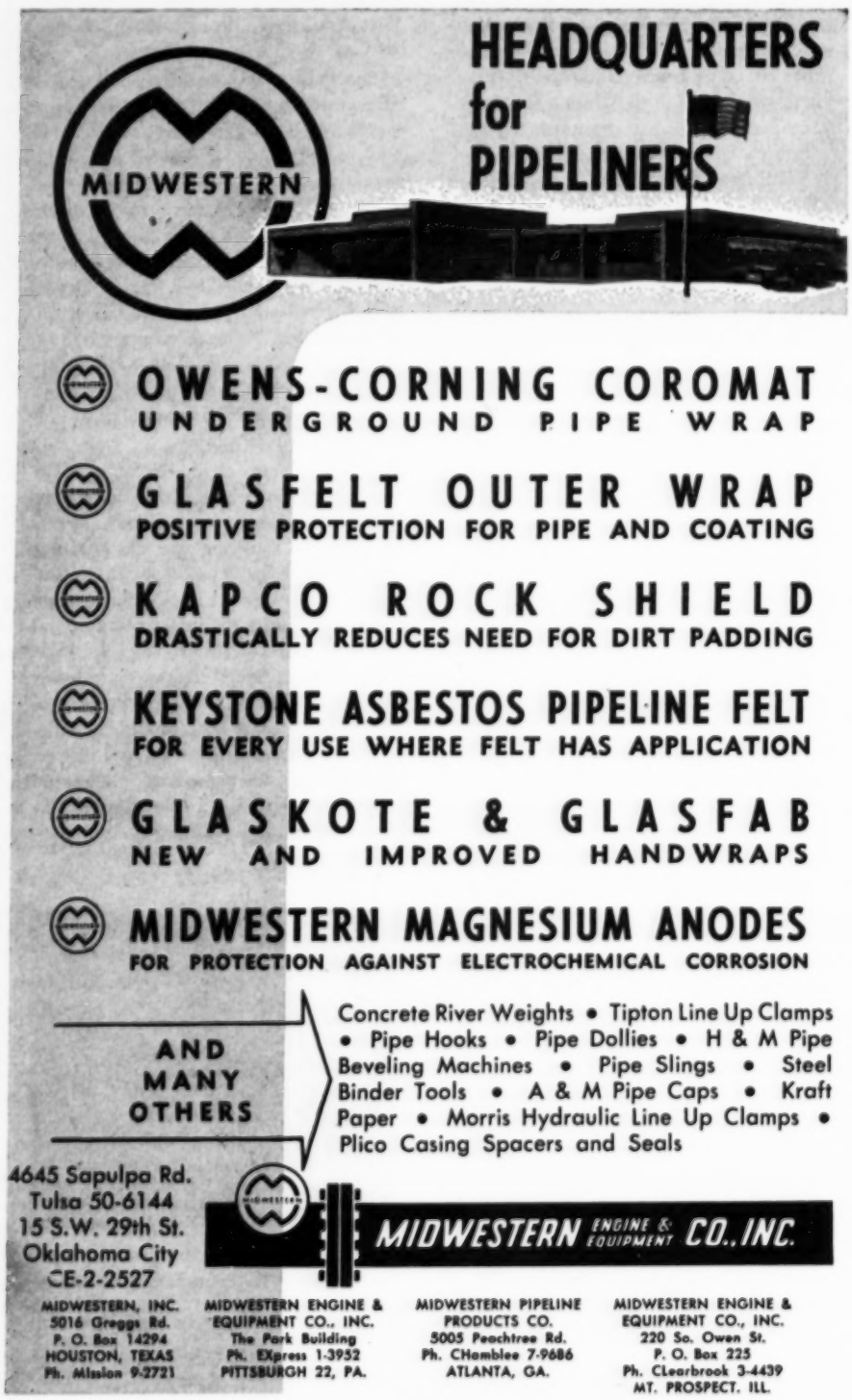
The line is planned to pick up natural gas brought to Toronto from Louisiana via Tennessee Gas Transmission Co. and Trans-Canada Pipe Lines facilities. The gas will enter Canada near Buffalo. TGT's part of the project to serve Toronto is a 45-mile spur line to be built from a point on the company's existing line southeast of Buffalo to a point on the Niagara river between Niagara Falls and Lake Ontario. Contract has been let to Bechtel Corp. and construction is expected to start in the near future. An underwater crossing will be constructed at the Niagara river.

Oklahoma's governor says gas reserves are limited

Natural gas reserves in Oklahoma are limited and "will be depleted in less than 10 years," Gov. Johnston Murray wrote the FPC recently, and suggested that the commission do what it can to hold down the price of gas in Oklahoma fields.

He claims that bidding by gas purchasers "has caused the price of gas . . . to approximately double in the last two years . . . This is costing $10 million per year to consumers in Oklahoma. Any additional increase in the price of gas will impede economic and industrial development of Oklahoma."

The letter went on to say that "The fact that these companies are presently negotiating with producers with offers of additional increases . . . of approximately 50% of present levels threatens us with an additional increase in the general price of gas in the state, with attendant losses of potential additional economic and industrial development."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Examination of longest and oldest continuous mastic application to a product pipe line in the Mid-Continent area . . . after 9 years of service. *(Extracted from "Examination of 335 Miles of Asphalt Mastic Coated Pipe," by Donald E. Miltner, published in July, 1953 Corrosion, publication of the National Association of Corrosion Engineers.)*

"The 335 miles of 6⅝ inch OD pipe line extends from Topeka, Kansas, to Sioux Falls, South Dakota. A lightweight pipe of 14.96 pounds per foot was used in this construction because the line was to be coated in its entirety and in addition maintained under cathodic protection. This weight of pipe was selected to allow an adequate factor of safety for the normal range of operating pressures and yet provide for maximum economy in overall investment costs. Five cathodic protection rectifier units were installed soon after construction of the line was completed.

"The three principal methods used to examine the nine year old coating were:

1. A modified Pearson coating discontinuity survey.
2. Inspection of a representative number of indicated coating failures.
3. Coating conductance measurements on isolated sections of the gross structure.

Results. "This survey indicates that the inspection made of the coating during manufacture and construction of the line was of a high order.

"The rate of discontinuities was found to be one per four miles of pipe line. This exceedingly low rate substantiates the high quality of the coating found in the examination.

"The coating was almost completely unaffected by soil stress with the whitewash largely intact.

"The low discontinuity rate per mile and small area of affected coating shows that moderate protective voltages have not affected the sound coating for at least nine years.

"The total area of coating adversely affected from any cause whatsoever was approximately 50 square feet in over 3 million square feet of pipe coating."

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Panhandle would construct 575 miles of new line

Panhandle Eastern Pipe Line Co.'s recent application to the FPC (Docket G-2433) would call for increasing its peak day delivery capacity from 970 MMcf per day to 1425 MMcf. (See June *GAS*, page 122.)

Approximately 575 miles of new line, including mainline loop, storage lines, lateral lines, and gathering lines, would be built in Kansas, Missouri, Illinois, Indiana, and Michigan at a cost of $66,750,000. Panhandle said that the project would enable it to increase its mainline sales capacity by approximately 255 MMcf per day by the construction of 294.6 miles of additional loops paralleling sections of its existing system, and the installation of 113,000 hp in additional compressor capacity.

In conjunction with the development of the Waverly storage field in Morgan county, Ill., which is included in the project, Panhandle plans to construct 6.34 miles of line, a 4290-hp compressor station, regulating and measuring equipment, a dehydration plant, and to drill 20 wells. Peak-day deliveries from the storage area would be 200 MMcf of gas.

In addition, the Kansas City, Mo. company plans to construct facilities for the production and gathering of the new gas supply which would be necessary for the proposed increased capacity. In this connection, Panhandle would drill 80 wells and construct 178 miles of gathering lines and 9600 hp at eight field compressor stations in the Hugoton field and Anadaro basin in Texas, Oklahoma, and Kansas.

Panhandle plans to dispose of 210 MMcf per day by selling an additional 100 MMcf to East Ohio Gas Co., Cleveland; 50 MMcf to Ohio Fuel Gas Co., Columbus; and 60 MMcf to Michigan Gas Storage Co., Jackson, Mich.

The remaining 45 MMcf of mainline capacity and the initial capacity resulting from the operation of the Waverly storage field, expected to be about 150 MMcf per day in the 1955-56 winter season, would be made available to Panhandle's customers with whom it has service agreements for the purchase of gas.

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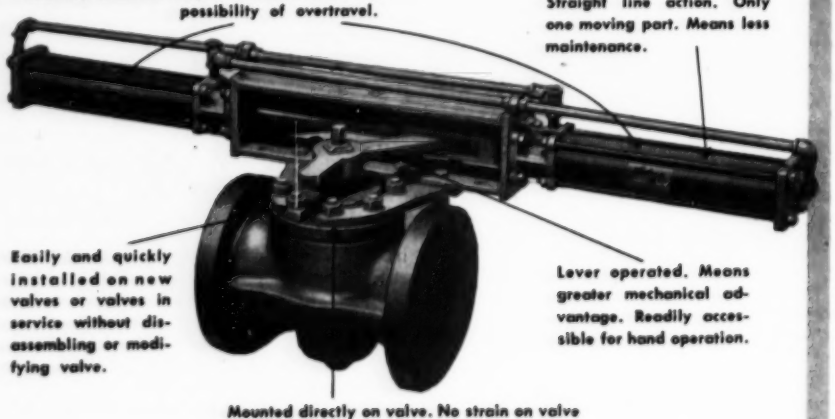
Two cylinders working in tandem transmit smooth, constant torque to valve lever. No possibility of overtravel.
Cylinder-type operator. Straight line action. Only one moving part. Means less maintenance.
Easily and quickly installed on new valves or valves in service without disassembling or modifying valve.
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Louisiana legislators kill 75% unitization bill

A bill to permit unitization of gas and oil fields on consent of 75% of the royalty and property owners and oil operators has been killed by Louisiana legislators when they voted to table the entire subject.

The sponsor of the bill, Sen. Charles Tooke Jr., said the bill would have given the conservation commission authority to act to recover enough oil and gas, which would otherwise go unrecovered, to boost the collection of severance taxes from that source by $165 million over the next 15 years.

Sen. Dayton McCann, who made the tabling motion, argued that the bill would give too much power to the conservation commissioner.

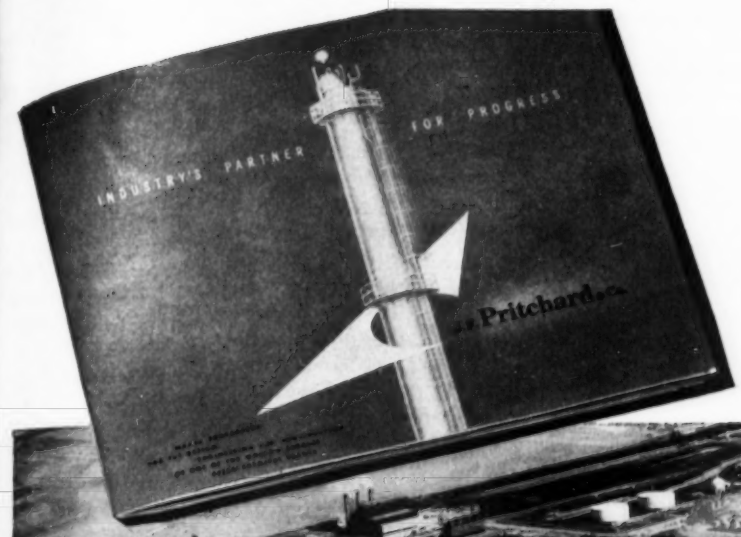
Columbia subsidiaries ordered to cut rates

Two Columbia Gas subsidiaries, Manufacturers Light & Heat Co. and Home Gas Co., both of Pittsburgh, have been told by the FPC to reduce rate boosts they've been collecting subject to refund.

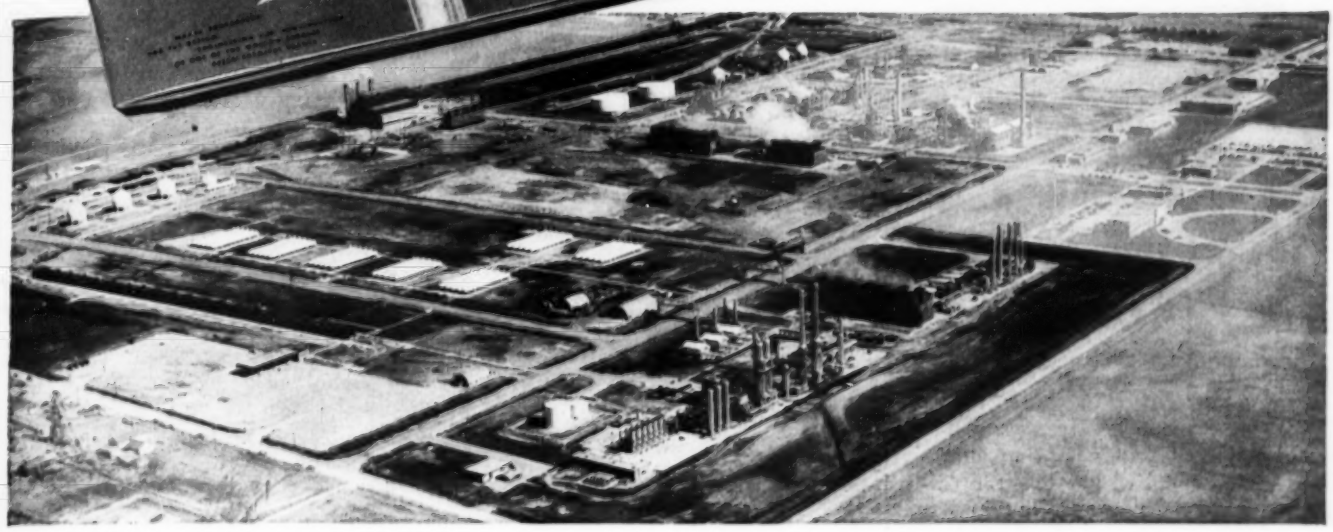
Manufacturers will have to cut the $1.1 million increase it's been collecting since last October by about $317,000. However, the commission said Manufacturers could keep about $2.1 million in other wholesale increases. Home Gas has been collecting a proposed $1.6 million hike, which will now have to be reduced by about $550,000.

Recent applications for higher rates filed with the FPC include that of Northern Natural Gas Co., Omaha, seeking an $8,128,400 boost; Panhandle Eastern Pipe Line Corp., Kansas City, Mo., has filed for an increase of $12,128,000.

The FPC has settled the following requests: Amere Gas Utilities Co., Charleston, W. Va., gets $17,679, requested $28,400; Tennessee Natural Gas Lines, Nashville, gets $193,613 instead of $159,141 allowed previously by the FPC pending outcome of court review; Central Kentucky Natural Gas



Like to have a picture story of this petro-chemical plant?



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Co. gets $111,000, requested $1,182,000; Atlantic Seaboard Corp., Charleston, gets $856,000, requested $2,496,000.

The FPC also suspended Lake Shore Pipe Line Co.'s request for a $113,570 hike and dismissed Southern Tier Gas Corp.'s $18,400 request.

Coal gasification project may be reactivated

Support of the proposed government-industry reactivation of the underground coal gasification experiment at Gorgas, Ala., has been given by Rep. Ivor D. Fenton (R.-Pa.), who proposes to spearhead authorization of the project.

According to a Bureau of Mines official, if the project is authorized it would be conducted jointly by the bureau, the Alabama Power Co., and Stanolind Oil & Gas Co., which developed the Hydro-Frac process.

The project would run for several months and cost about $70,000, with two-thirds of the funds supplied by the two companies and the remainder by the Bureau of Mines.

The Gorgas coal gasification activity was operated by the bureau for several years, but was denied funds by Congress a year ago. The bureau has been conferring with House and Senate appropriations committees for authority to enter into a cooperative agreement with the two companies.

Colorado PUC approves $21 million state line

Permission to build a $21 million natural gas pipeline from the San Juan basin of southwest Colorado to Pueblo, Colorado Springs, and Denver has been given to the Colorado-Western Pipeline Co. by the Colorado Public Utilities Commission.

The line's construction was protested by the Colorado Interstate Gas Co., which now serves the eastern Colorado area and which plans to bring additional gas to Denver through its connection with the Pacific Northwest Pipeline Corp. line at Rock Springs, Wyo.

John A. McGuire, Colorado-Western president, stated that neither Colorado Interstate nor Public Service Co. of Denver had made any offer for Colorado-Western's gas, although he had offered it to CIG for delivery at either Denver or Pueblo. He is of the opinion that the purchase of the gas by CIG would result in a lower "rolled in" rate than the "rolled in" rate that would result from the Pacific Northwest connection. If Public Service were to buy gas from Colorado-Western, the price would be higher than it is presently paying to CIG but cheaper than the gas to be brought in from Rock Springs.

Market studies have been made, and President McGuire is confident that there is a market for 100 MMcf in the Colorado area between Pueblo and Denver, including those two cities and Colorado Springs. Survey call for delivery of 50 MMcf of gas per day at Pueblo and 50 in the Denver area.

Paul Kayser, president of El Paso (Texas) Natural Gas Co., testified that El Paso would exercise its option to purchase two-thirds of the common stock of Colorado-Western and would take over its management and operation. He said he had offered to sell gas to CIG but, if unsuccessful, would "use his best efforts to develop a market elsewhere."

The line will start in the Ignacio field just south of Ignacio, and travel 328 miles through the counties of La Plata, Archuleta,

Participating in the dedication ceremonies marking the site of the No. 1 Lockridge well in the Petrolia field in North Clay county, Texas, were L. T. Potter, executive vice president of Lone Star Gas Co. (left), shaking hands with H. P. Nichols, executive vice president of the East Texas Oil Association. Eddie Kadane, former president of the North Texas Oil & Gas Association, is shown standing on the speaker's platform. The completion of this well in 1907 launched the intensive development of the natural gas industry in Texas. Lone Star, which erected the monument, dates its beginning with the Petrolia field.

Mineral, Rio Grande, Alamosa, Huerfano, El Paso, Douglas, Arapahoe, and Denver. Two-hundred and twenty miles of 18-in. would extend from Ignacio to Pueblo and 108 miles of 16-in. from Pueblo to Denver. It provides for a gathering system in that part of the Ignacio field now owned by El Paso and under contract to Colorado-Western and a gathering system for an additional 50 MMcf a day from sources other than El Paso. Compressor stations at Ignacio and Pueblo would aggregate 9060 hp.

The commission said its decision puts the PUC in a position "to protect the public against uncontrolled or exorbitant rates or inadequate service." Because CIG is an interstate company, the state commission has no jurisdiction over its rates for the sale of gas to the distributing systems at Trinidad, Pueblo, LaJunta, Colorado Springs, and Denver. In its brief, the commission declared that " The question as to the jurisdiction over direct sales, such as those to Colorado Fuel & Iron Corp. at Pueblo . . . is still undecided, and Interstate now asks this commission to protect its monopoly by denying the . . . application."

The commission also quoted a paragraph from the Public Service contract, which reads "In the event that natural gas is discovered in commercial quantities in the state of Colorado within a radius of 250 miles of the city of Denver, it is agreed it may be desirable to arrange for the purchase of such natural gas by the seller (Interstate) and the marketing thereof hereunder, and the buyer (Public Service Co.) agrees to use its best efforts to cooperate with the seller in the distribution of such natural gas. Upon failure of the seller to purchase or dispose of any such natural gas, or to participate in the purchase or the disposal thereof, then the buyer shall have the right to purchase and market that part of such natural gas which, if such purchases were not made, would be offered for sale in its area of service . . . The buyers' right to do so shall be limited to a maximum of 25% of its annual requirements."

The commission went on to say that "In other words, Public Service has a firm contract to purchase at least 75% of its gas requirements from Interstate until 1967. The record shows no cooperation between the parties and no effort on the part of either to obtain gas from any other source and any such purchase on the part of Public Service is limited to 25% of its requirements. The price of gas delivered through the Rock Springs connection of Pacific Northwest is estimated at 32 cents per Mcf. Under the 'rolled in' rate theory, this gas would be injected into the Interstate system at Denver and all other gas customers of Interstate would share the cost. This would include not only the Rocky Mountain area of Colorado . . . but also the Natural Gas Pipeline of America, serving the greater Chicago area . . . and other customers, reducing the cost at Denver to an estimated 25½ cents per Mcf. However, we are not interested

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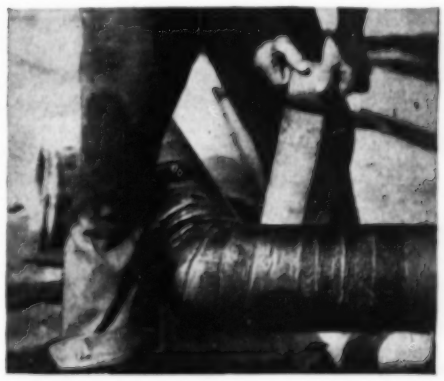

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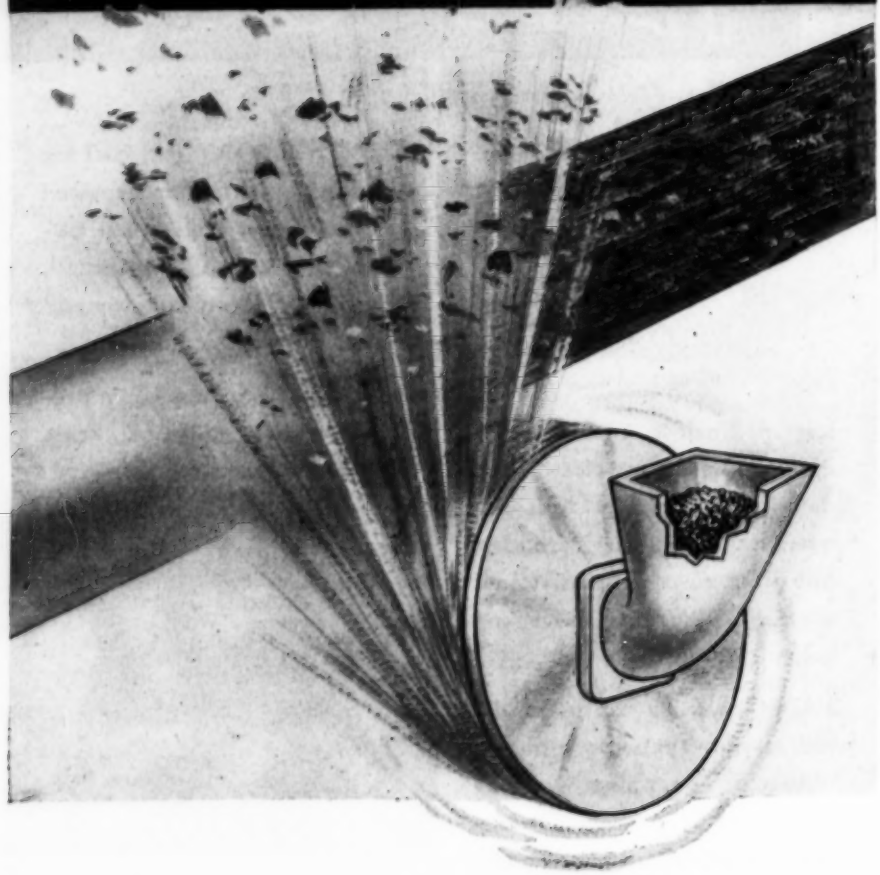

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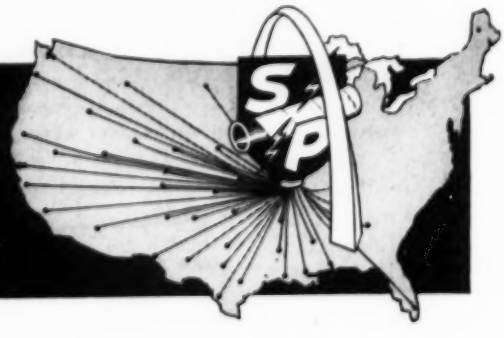

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solely in Denver and no matter how you slice it, the delivery cost at Denver must be considered at 32 cents as compared with the proposed cost of gas delivered by Colorado-Western."

INGAA annual meeting set for New Orleans

Details of the program for the 1954 annual meeting of the Independent Natural Gas Association of America, to be held at the Roosevelt Hotel, New Orleans, Sept. 13-14, have been announced.

On Monday, Sept. 13, subcommittees on taxes, rates, and insurance, will meet as will the following: producers committee, pipeline committee, public information program advisory committee; a joint meeting of the legal committee and the legal study group for pipeline committee.

On Tuesday, Sept. 14, the program for the general session will be as follows:

Ralph E. Davis, consulting geologist, will present "A Discussion on Natural Gas Reserves."

The Hon. S. L. Digby, member of the Federal Power Commission, will talk on "The Natural Gas Act."

"Atomic Energy Developments and Electric Competition" will also be discussed.

N. E. Tanner, president of Trans-Canada Pipe Lines Ltd., will address the meeting on "A Look at Canadian Natural Gas."

"How the FPC Interprets the Supreme Court Opinion in the Phillips Case," by Willard W. Gatchell, general counsel, FPC, and Scott Hughes, chairman, INGAA legal committee.

"A Discussion of the Progress of the INGAA Public Information Program" will be the subject of talks by the chairman of the advisory committee, W. E. Wilson, and V. R. Fowler of Bozell & Jacobs, Inc.

The Hon. T. Coleman Andrews, Commissioner of Internal Revenue, will be the dinner speaker.

At the business luncheon on Tuesday, Sept. 14, during which President C. P. Rather will make his report to the membership, there will be an election of members to the board of directors. Later that day the board will meet and elect officers for the coming year.

Gill and Mannix firms form Canadian company

The J. B. Gill Co., of Long Beach, Calif. and Tulsa, and the Mannix Ltd., of Calgary, Alta., have formed Mannix Gill Ltd., a Canadian company to specialize in engineering and construction of petroleum processing and transportation facilities, sulfur plants, gas-treating units, petrochemical installations, steam and diesel power plants.

Officers of the company are F. C. Mannix, chairman of the board; Glen J. Gill, president and general manager; E. Connelly, treasurer; E. W. Costello, secretary; P. J.

Soukup, vice president; W. G. Palmer, chief engineer and assistant manager; B. E. Kimberlin, general superintendent; and H. D. Saunders, chief estimator and purchasing agent.

Headquarters for the company are in the Oil Exchange building in Calgary.

Columbia subsidiaries cut Ohio activities

Because the Ohio Public Utilities Commission rescinded $1,415,211 from a previously granted emergency rate increase, two Columbia Gas System subsidiaries are freezing $1 worth of natural gas line construction in Ohio, are sharply curtailing services to consumers, and are banning gas deliveries to new industrial customers.

John C. Petersen, president of both Manufacturers Light & Heat Co. and Natural Gas Co. of West Virginia, said the companies will offer only those services necessary to meet the minimum requirements under their franchises.

The freeze, which includes a halt on installations of new gas house-heating equipment, affects some 66,000 residential, commercial and industrial retail customers in a nine-county Ohio area. A spokesman for the companies said last year the subsidiaries lost a total of about $1.6 million on their Ohio operations.

Scope of coal intervenors' interest ruled on by FPC

The scope of the interest of the coal intervenors in natural gas certificate cases before the Federal Power Commission was the subject of an order issued by the commission in reversing a ruling of a presiding examiner in a South Georgia Natural Gas Co. case (Docket G-1915).

During the hearing, the presiding examiner had denied permission to the counsel for the coal intervenors to cross-examine one of the witnesses, the commission order explains, adding:

"The direct testimony of the witness was given on behalf of a power company which presently uses oil exclusively as a fuel for generation of electricity and would, if the certificate of public convenience and necessity were granted, use natural gas for such purpose. Because of this factual situation, the presiding examiner concluded that the coal interests represented by the intervenors could not possibly be aggrieved by the power company's proposed use of natural gas, and that, therefore, no question that might be asked of the witness within the scope of his direct testimony could have any bearing on the sale of coal to the power company.

"The joint petition to intervene filed by these representatives of competitive fuel interests 'in opposition to the granting of the certificate of public convenience and necessity applied for in this proceeding' clearly asserts concern not only with respect to cur-

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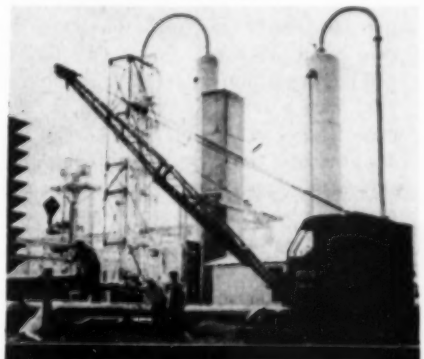
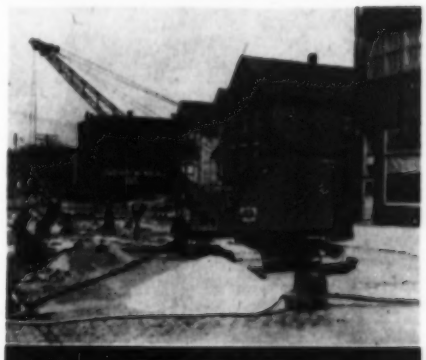


STATION MAINTENANCE



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rent uses of coal but more importantly with the possible destruction of future potential markets for coal.

"The presiding examiner's ruling completely denying counsel for these intervenors the right to cross-examine the power company witness should be reversed and the proceeding reopened to accord due process of law."

Two Colorado fields to have gathering system

Nine operators of the Little Beaver and Badger Creek fields in Washington and Adams counties, Colorado, have approved the construction of a gas products plant and gathering system to process produced gas from these fields.

Initial construction will consist of compression facilities to boost 7500 Mcf of gas per day from 1 psig plant suction to 850 psig plant discharge. Stabilizing facilities will be provided to separate the gasoline and LPG, which is condensed during the compression process. The initial plant will be so designed that complete liquid extraction facilities can be added at a later date pending economic study and approval of the plant owners. Continental Oil Co. will operate the plant.

Low pressure gas now being produced in the fields will be gathered, compressed and sold from the plant outlet to a utility in the area. Initial construction was expected to start last month with completion date set for October.

Supreme Court to review Colorado Interstate case

The Supreme Court will review portions of a decision of the Tenth Circuit Court of Appeals that invalidated a condition under which the FPC has excluded certain losses from gasoline operations from cost of service in a Colorado Interstate Gas Co.

The FPC says that in Docket G-1326, the certificate case involving the merger of CIG and Canadian River Gas Co., one condition imposed by the FPC was that Colorado would extract hydrocarbons and the gasoline losses would not be considered part of the cost of service. It says that in the Colorado rate case, the FPC excluded the gasoline losses from the cost of service, and that neither in the hearing on the rate case nor in the court case, which Colorado instituted to protest the FPC order in the rate case, did CIG raise any objection to the effect that the merger condition was invalid, the company contending only that the allocation of cost on gasoline loss was improper.

The Circuit Court held that the FPC's method of allocation was proper, but that the merger condition imposed by the FPC was invalid, hence the FPC should not compel the company to deduct the loss from gasoline extraction. The FPC contends that since the company did not raise the issue, the court had no right to hold the condition invalid.

TGT gets FPC approval of Northeastern Gas merger

Although subject to review by the FPC, a decision has been filed by Presiding Examiner Woodall authorizing Tennessee Gas Transmission Co., Houston, to acquire by merger all of the facilities of Northeastern Gas Transmission Co., a wholly owned subsidiary.

The decision also authorizes Northeastern to abandon its service and to transfer its facilities to Tennessee, which would continue to perform the same service as Northeastern, which supplies the New England market.

Examiner Woodall rejected contentions by opponents of the merger that unless Northeastern is required to be maintained as a separate corporate entity by Tennessee, the FPC may permit the parent company at some future time unjustly and discriminately to pass on to or unload on TGT's other customers some part of the cost of service of the New England customers.

El Paso Natural proposes three-state construction

A 74-mile pipeline in Texas, New Mexico, and Arizona has been proposed by El Paso (Texas) Natural Gas Co. The proposed project would also include 6925 in additional hp and cost approximately $13.8 million (Docket G-2106 and G-2462).

In a separate application, El Paso asked that the FPC amend a previously issued certificate to permit changes in the authorized facilities that the company said were necessary primarily as a result of changes in certain sources of gas supplies in the Permian basin area, principally in the Goldsmith and Spraberry fields in west Texas.

Texas Eastern to build 58-mile Texas line

Texas Eastern Transmission Corp., Shreveport, has filed an application with the FPC to construct and operate 58 miles of 20- and 16-in. pipeline from Joaquin to Longview, Texas, at an estimated cost of $3,269,000.

The proposed construction would consist of 26.5 miles of 16-in. line extending from the company's compressor station near Joaquin to the Carthage field in Panola county, and 31.5 miles of 20-in. line from the point of termination of the 16-in. line to the south terminus of the company's 24-in. pipeline near Longview.

The proposed construction would permit gas from the company's lines originating at Provident City, Texas, to be transferred to its 24-in. line originating at Longview.

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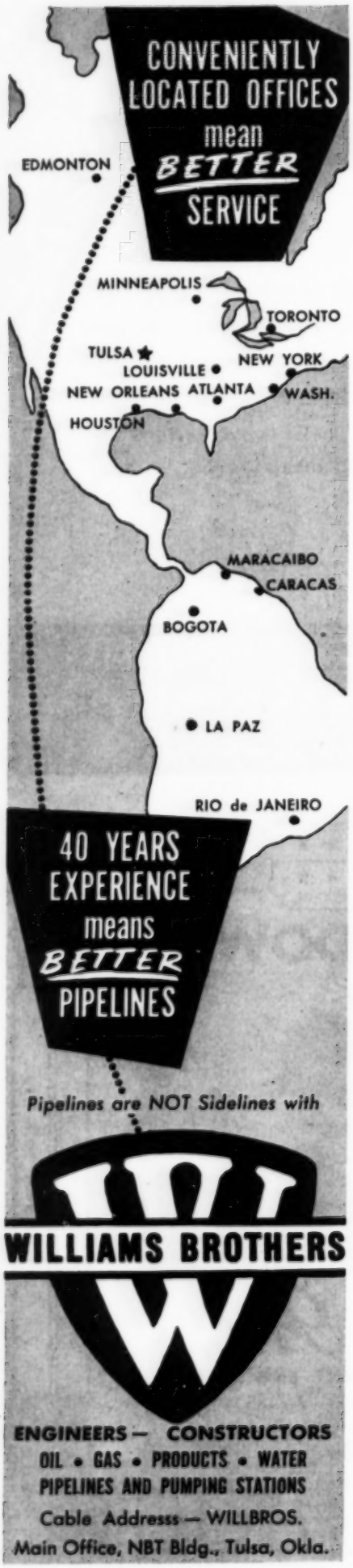

Pipeline Notes

Development in the tidelands from the mouth of the Rio Grande river to the mouth of the Mississippi could increase oil reserves approximately 20% in the next five years, according to Ben C. Belt, vice president of Gulf Oil Corp. He based his forecast of a substantial increase in petroleum reserves on the federal government offering leases for sale in such quantities to permit spirited wildcatting and development, which could easily add from 4 to 6 billion bbl of oil and some 15 to 20 trillion ft of natural gas.

The Louisiana senate voted 32-0 on a house-passed bill that redefined the gas gathering tax in the light of the U. S. Supreme Court's recent decision (see GAS, March, page 152). The new Louisiana bill would assess the tax at the first meter instead of at the wellhead, making it a gas transporting instead of gathering tax.

Fluor Corp. of Canada Ltd., of Toronto, a subsidiary of the Fluor Corp. of Los Angeles, has opened a new sales office in Calgary, Alta., with Charles G. Bragg as resident manager.

Operating revenues of natural gas pipeline companies totaled $129,193,748 in April and $1,494,946,040 for the 12-month period then ended, representing increases of 7.8% and 20.4% over revenues received in a like period last year, the FPC reports. During the month gas sales to other gas utilities for resale, the principal business of the reporting companies, were 384,516 MMcf, 1.1% under April 1953. Sales to ultimate consumers during April were 102,031 MMcf, a 5.1% increase.

A bill whose purpose is to increase exploration for oil and gas in public lands has been passed by the Senate and sent to the House. The bill increases to 46,080 acres from the present 15,360 acres the amount of public land in a single state that any one individual or company may hold under gas or oil leases. The bill would also increase the amount that could be held under option in any state by any one holder from 100,000 acres for two years to 200,000 for three.

Saskatchewan Power Corp. plans to extend its Brock-Saskatoon natural gas system to include the towns of Sutherland, Vanscoy, Tessier, Harris, and Zealandia. The system was completed last year, bringing gas from the Brock field in west-central Saskatchewan to Saskatoon.

An oral argument has been scheduled by the FPC for Oct. 4 on a proposed amendment to the section of the Uniform System of Accounts for Natural Gas Comapnies relating to accounting for inventories of natural gas stored underground. The proposed amendments would modify the existing instructions relating to the cost components to be included in the pricing of inventories of gas stored underground by directing that the cost of its transmission to the storage area and the cost of storing it underground shall be added to the cost of purchase or production of such gas. Interested persons intending to participate in the oral argument are to advise the secretary of the FPC by Sept. 14.

Frederick Stueck took the oath of office last month as a member of the FPC, succeeding Dale Doty. From 1941 until 1949 Mr. Stueck was chairman of the Missouri Public Service Commission.

Massena Murray, brother of Governor Murray of Oklahoma, has succeeded Walter T. Pound as director of oil and gas conservation department of the Oklahoma Corporation Commission. The new director had been assistant conservation officer in charge of field operations.

The oil and gas division will receive $250,000 for the fiscal year, which began July 1, under the compromise Interior Department appropriations bill. The division's original request for $300,000 was slashed to $100,000 by the House but restored to $300,000 by the Senate. House-Senate conferees settled for $250,000.

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Progress Reports

NEW CONSTRUCTION PLANNED

EL PASO (Texas) NATURAL GAS CO. Docket G-2106 and G-2462 for 74 miles of line and 6925 additional hp on its system in Texas, New Mexico, and Arizona.

KANSAS-NEBRASKA NATURAL GAS CO., Phillipsburg, Kan. To build 36 miles of lines to serve communities in two northeast Colorado communities.

NORTHERN NATURAL GAS CO., Omaha. Docket G-2485 for 9-mile, 30-in. line north of Clifton, Kan., and one 2000-hp addition at Sunray, Texas, to serve Allied Chemical & Dye Corp.

NORTHERN NATURAL GAS CO., Omaha. A line from Tioga to Fargo, N. D., eventually to serve 15 cities in North Dakota and extend to the Twin Cities in Minnesota.

PANHANDLE EASTERN PIPE LINE CO., Kansas City, Mo. Docket G-2433 for 575 miles of new line, mainline loops, storage, lateral and gathering lines in Kansas, Missouri, Illinois, Indiana, and Michigan and 113,000 hp in additional compression. Also includes development of Waverly storage field in Morgan county, Ill. Will increase peak-day delivery capacity from 970 to 1425 MMcf daily.

TEXAS EASTERN TRANSMISSION CORP., Shreveport. To construct 58 miles of 20- and 16-in. line from Joaquin to Longview, Texas.

TRANSCONTINENTAL GAS PIPE LINE CORP., Houston. Docket G-2406 for 25-mile, 12-in. lateral line and meter station in Cameron and Calcasieu parish, La., to get additional gas in Orange, Chambers, and Jefferson (Texas) counties from Texas Gas Pipe Line Corp.

CURRENT CONSTRUCTION

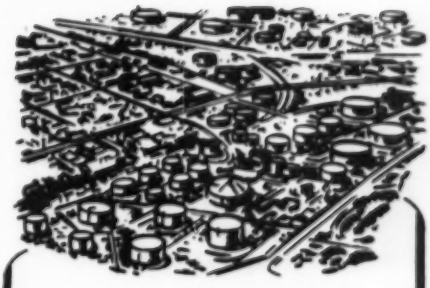
GULF INTERSTATE GAS CO., Houston. Docket G-2058 to construct 860 miles of 30-in. line from Rayne, La. to Boyd county, Ky., 229 miles lateral lines and five 8000-hp compressor stations in four states. Mainline contracts let to H. C. Price and Houston Contracting Co. Lateral line contracts let to Anderson Bros., Associated Pipe Line Contractors and Williams Bros. Line to be in service Nov. 1, 1954. Over 700 miles of 30-in. line completed.

MISSOURI PUBLIC SERVICE CO., Warrensburg. Mid-States Construction Co. was scheduled to begin work May 15 on 25 miles of 10-line line from Warrensburg to Clinton.

OHIO FUEL GAS CO., Columbus. Docket G-2288. Studying bids or bids out for 7.5-mile, 16-in. Berlin Heights to Norwalk; 6.6-mile, 16-in. to Kenton; 13.3-mile, 16-in. replacement North Baltimore to Bowling Green. Construction under way on 11-mile, 20-in. and 10½-mile, 16-in. New Riegel to North Baltimore.

PACIFIC GAS & ELECTRIC CO., San Francisco. Docket G-2102 to build about 200 miles of 34-in. mainline loops and add 2500-hp compressor capacity to company's 500-mile Topock-Milpitas line. Pipeline work under contract to Engineers Ltd. Pipeline Co. Compressor to Bechtel Corp. Project to be completed in 1954. One hundred and seventy-three miles 34-in. loop now in operation. Associated construction of 7.2-mile, 30- and 34-in. and 1.9-mile, 22- and 24-in. between Milpitas and Irvington proposed for 1954 construction.

SOUTHERN NATURAL GAS CO., Birmingham. Docket G-1907. About 250 miles various size line and 4400 hp compression remaining for construction in 1954 and 1955. Construction on 100 miles of 18-in. underway.



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WRITE FOR CATALOG

TENNESSEE GAS TRANSMISSION CO., Houston. Docket G-1969 for permission to carry gas for Iroquois Gas Corp., Buffalo, to export gas to Niagara Gas Transmission Ltd., Toronto, and to construct 904 miles of line—571 mile, 30-in. from Kinder, La. to Portland, Tenn.; 63 miles of 26-in. loop in Ohio; 45 mile, 20-in. line from Buffalo to U. S.-Canadian border; 58 mile, 20-in. line from Gulf Coast to Kinder station; and 100 miles of laterals in Texas; 17,520 hp additional at existing stations; 6600 hp in one new station. Contracts let to Morrison Constructors Inc., Anderson Brothers Corp., Houston Contracting Co., Oklahoma Pipe Line Constructions, Western Pipe Line Constructors Inc., and Panama-Williams Co. for Kinder, La. to Portland, Tenn. line; H. C. Price Co. for the Ohio loop lines; and Bechtel Corp. for spur line from TGT system to Canadian border. All spreads working on the Kinder-Portland line and 110 miles have been lowered in. Work has begun on Ohio loop line.

TEXAS EASTERN PENN-JERSEY CORP., Shreveport. Docket G-2341 to construct 265 miles of 24-in. line from Oakford storage field (Pa.) to Texas Eastern Transmission Co.'s Lambertville, N. J., compressor station; a 3300-hp compressor station near storage field. Parkhill Truck Co. hauling, stringing, and unloading approximately 96-miles 24-in. pipe from Mt. Union, Pa. to Duncannon, Pa., and Blairsville, Huntingdon, Pa. Williams-Austin Co. and H. C. Price Co. are contractors. Work on all spreads, river crossings, and the compressor station under way and on schedule.

TRANSCONTINENTAL GAS PIPE LINE CORP., Houston. Docket G-2362 for 19-mile, 12-in. line and sale of existing 14-mile, 6-in. line in Vermilion parish, La. Associated Pipe Line Contractors at work. To be completed Oct. 1.

TRANSCONTINENTAL GAS PIPE LINE CORP., Houston. Docket G-2368 for 57 miles of line parallel to existing system in Louisiana, Mississippi, and Alabama. Contracts awarded to Associated Pipe Line Contractors Inc. Work commenced July 12; to be completed Nov. 1, 1954.

TRUNKLINE GAS CO., Houston. Docket G-2402 for two 24-in. Mississippi river crossings in the Greenville, Miss. area. Also 26-in. interconnecting lines to link new crossing with company's system. Missouri Valley Dredging Co. at work on job. Completion expected Oct. 15.

UNITED FUEL GAS CO. and CENTRAL KENTUCKY NATURAL GAS CO., Charleston, W. Va. Docket G-2285 for construction of a 4400-hp compressor station at its storage pool X-59 in Jackson county, W. Va. Also 59 miles of line and 6000-hp compressor station. Contract let to H. C. Price Co. for 57 miles of 30-in. More than 31 miles completed.

APPROVED

ARKANSAS LOUISIANA GAS CO., Shreveport. Docket G-2307 for 136 miles of 6⅝- to 24-in. line in 12 sections, and 10,500-hp compressor station on its system in Arkansas, Louisiana and Texas.

CITIES SERVICE GAS CO., Oklahoma City. Docket G-2383 for 24-mile, 26-in. replacement line in Franklin and Johnson counties, Kan., and 9-mile, 20-in. replacement line in Cherokee and Jasper counties, Mo.

COLORADO INTERSTATE GAS CO., Colorado Springs. Docket G-2121 (1954 program) 365 miles of 22-in. line from Denver to connection with proposed Pacific Northwest Pipeline Corp. line at Green River, Wyo., with 5500-hp compressor station at Green River.

OHIO FUEL GAS CO., Columbus. Docket G-2401 for 24.5-mile, 20-in. line in Richland and Crawford counties, Ohio, to enable it to transport additional gas from underground storage.

TEXAS GAS TRANSMISSION CORP., Owensboro, Ky. Docket G-2361 to construct 24 miles, 16-in. line in south Louisiana; add 2000-hp compressor unit at Bastrop, La.; and build purchase meter station in south Louisiana.